THE IRON TRADE REVIEW

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LARGE INCREASE

IN NEW ORDERS TAKEN BY THE AMERICAN BRIDGE CO.

Pig Iron Market Quiet, But Firm—Bar Iron Advanced—Heavy Sales of Iron Ore.

The tremendous demand for finished materials has continued unabated, but transactions in pig iron are comparatively light. The reluctance on the part of both buyers and sellers of pig iron to make contracts for delivery after the first quarter of next year is not attributed to any weakness of the market, but to the fact that nearly all buyers have covered for their requirements up to the first of April and to the uncertainty concerning the price of coke. There are indications that the high prices of coke which it was feared would prevail will not be asked by the producers. The supply of cars in the Connellsville region has improved greatly, and the price of foundry coke dropped from $4.00 to $3.75 for prompt delivery, while furnace coke is selling at about $3.00. It is expected that there will be much trouble during the winter in delivering coke, but the prospect is more favorable than it was some time ago. Sales of ore at an advance of 50 cents over quotations of the early part of the present year have been very heavy and some sellers have already disposed of their choice ores.

Throughout a large part of the country the prevailing price for Northern No. 2 pig iron is now $18.00 at the furnaces; but Chicago is an exception to the rule, as in that city $20.00 is asked for contracts for delivery the first half of 1906. The Southern situation is not so strong, although some buyers are asking $15.00 for No. 2 foundry, Birmingham, and the usual selling price is $14.50, one interest is taking orders on the $14.00 basis. Negotiations with the Steel Corporation for the purchase of Bessemer from valley interests are still pending. A significant fact is that the Pencoyd plant, which is ordinarily supplied with basic pig iron by furnaces of the Corporation in the Pittsburg district, has obtained 8,000 tons of basic from the Bethlehem Steel Co. The laying of pipe for the New York water works will require a very heavy tonnage of iron. Sales of pig iron in the east this week have been heavier than in any other part of the country.

The American Bridge Co. expects that the tonnage which it will book for November will be at least twice as large as that for October. This company has been awarded the contract for 30,000 tons of steel for bridges of Harriman lines, and 8,000 tons of steel for the North Western elevated construction at Chicago. Inquiries from other roads amount to 10,000 tons, while the erection of new buildings will require fully as large an amount.

Heavy sales of rails continue, the principal orders of the past week being Lehigh valley, 18,000 tons; Gould lines, 25,000, and miscellaneous orders making about 30,000 tons. The principal producer of bar iron has advanced the price to 2 cents per pound, Youngstown. This is a higher price than has prevailed for five years and is $10.00 per ton higher than steel. It is taken as an indication that the company is so well supplied with orders that it does not desire new business. It will probably result in a considerable tonnage of steel bars being purchased for purposes for which iron is usually used. The demand for steel bars at 1.50c is strong and prompt delivery cannot be given.

Some independent interests, which have been eager for orders for merchant pipe, are now firmer in their quotations, and it is expected that the principal producer will soon announce an advance. The recent new quotations on sheets are not being rigidly adhered to.

Crude steel is very scarce. Forging billets are selling at a minimum of $35.00, Chicago, and at Pittsburg there has been an advance of 50 cents on Bessemer billets.

There is a very strong demand for wire and wire nails and mills of the American Sheet & Tin Plate Co. are exceedingly busy, many new records having been made recently.

It will be interesting to see how the Canadian tariff commission will regard the peculiar operations which have been carried on with respect to the Canadian wire trade. The facts have been well known in the American iron trade, but the Canadian government is probably hearing of these operations for the first time. The general point is that Canadian wire producers are given immunity from competition in their finished products if they buy their rods from American producers. It will surely not look well to the Canadian government that the market in that country has been so open and exposed that a producer in the United States could elect just what business he preferred to take, and then enforce his terms on it. The Canadian wire producers find it necessary to accede to the terms laid down. If the bounty system, which applies in particular to the production of pig iron and crude steel, had been a real success, it would by this time have afforded the Canadian wire makers a source of supply for their rods independent of the mills in the United States.

THE WEEK IN IRON CENTERS.

PITTSBURG.

Scarcity of Billets Causes Advance.—Bar Iron Higher.—Coke Supply Improved.

OFFICE OF *The Iron Trade Review*,
521 PARK BUILDING, November 28.

The only features out of the ordinary during the past week have been the advance in iron bars and Bessemer billets and a temporary decline in the price of foundry coke, the former due to the great demand for these commodities and the latter to a deluge of box cars in the Connellsville district. Pig iron has been almost stationary, with but few sales reported, and these for but small quantities to cover immediate requirements. Ferro-Manganese is not obtainable at any price. The sales of sheets and tin plate at the advanced price of the leading interest have been considerable, but contracts are being taken only through the first quarter of next year on tin plate and for 60 days on sheets. The Monongahela plant of the American Steel and Tin Plate Co. was started during the past week, and others are being prepared for operation. Owing to the withdrawal of production restrictions by the Amalgamated Association of Iron, Steel and Tin Workers at the last conference, the leading interest has been able to increase its tonnage without marked advance in market prices on account of heavy business. The scarcity of bars has been a serious drawback.

The Republic Iron and Steel Co. on Monday advanced its price on common iron bars from 1.80c, Youngstown, to 2c, Youngstown, minimum base, which means 2.05c, delivered Pittsburg. Hoops were at the same time advanced from 1.75c to 1.90c on carload lots, and 1.95c on less than carload lots, with the regular hoop card for extras. Bessemer billets have advanced from $26 to $26.50. Muck bar took a brace during the week, and between 6,000 and 7,000 tons were contracted for at prices averaging $30.

Pig Iron.—Pig iron buying has been quiet during the week, and but few sales have been reported, and these only for small lots. The corporation has not entirely given up the idea of buying, but will not do so as long as the present prices prevail, hoping that by holding off its purchase will not cause a further advance. A meeting will be held this week in New York to discuss the matter. Bessemer and basic have been quoted from $17.25 to $17.75, valley, but the market is about $17.50, as it is doubtful that any iron could be secured for less than this figure. The inquiry for foundry iron has not been strong, and foundries are not buying ahead to any great extent, further than they have already covered. Southern iron, regular No. 2 grade, is quoted $14.50 to $15, Birmingham, or $18.95 to $19.15, Pittsburg. Virginia iron is quoted $16, furnace, or $18.55, Pittsburg. We quote:

Bessemer, Valley	$17.25 to $17.50
Bessemer, Pittsburg	18.10 to 18.35
No. 1 Foundry, Pittsburg	18.35 to 18.60
No. 2 Foundry, Pittsburg	17.85 to 18.10
Gray Forge, Pittsburg	16.85 to 17.35
Basic, Valley	17.25 to 17.50
Basic, Pittsburg	18.10 to 18.35

Ferro-Manganese.—There is no ferro-manganese to be had for prompt delivery, although $100 could easily be secured, and there have been offers of $125. The outlook in this commodity does not indicate any relief much before February 1.

Structural Material.—There has been no change in connection with structural material, although the mills, while they are in shape to take some new business, are assured of all they can do for next year. This amount of business is not actually on the books, but general conditions are such there can be no dispute regarding the statement. In some instances deliveries cannot be made inside of four to five months. We quote, unchanged, as follows:

Beams and channels, 15 in. and under, 1.70c; over 15 in., 1.80c; zees, 1.70c; tees, 1.75c; angles, from 3 to 8 in., inclusive, 1.70c; universal and sheared plate 6¼ in. and wider, 1.60c, base.

Plates.—Although business conditions would warrant an advance and mills are far behind, it has been decided to make no advance in prices, for the present at least, and makers will not take advantage of the situation, preferring to maintain the steady rate rather than increase the price at this time. In this the hand of the leading interest, with its usual conservative policy, ruled at the recent meeting. We quote, unchanged, as follows:

Tank plate, ¼ in thick, 6¼ in. to 100 in., 1.60c, f. o. b. mill, Pittsburg. Extras are as follows per 100 lb.: Flange and boiler steel, 10c; marine, A. B. M. A. and ordinary fire box, 20c; still bottom, 30c; locomotive fire box, 50c; plates over 100 in. up to 110 in. in width, not less than 5c extra; plates 110 in. to 115 in. wide, not less than 10c extra; 115 to 120 in., not less than 15c extra; plates 120 in. to 125 in. wide, not less than 25c extra; plates 125 in. to 130 in., not less than 50c extra; plates 130 in. wide, not less than $1 extra; plates 3-16 in. thick, 10c extra; gauges 7 and 8, 15c extra; No. 9, 25c extra. Five cents extra for less than carloads. Terms net cash in 30 days, and for all points of delivery in the United States except Pacific Coast.

Pipes and Tubes.—There has been no change in this market and conditions remain as they have been for the past six months. We quote:

	Steel		Iron	
Consumers' Carloads	Black	Galv.	Black	Galv.
⅛ and¼ inch	71	55	68½	52½
⅜ and ½ inch	75	63	72½	60½
¾ to 6 inches	79	69	77	67
7 to 12 inches	74	59	72	56½
EXTRA STRONG PLAIN ENDS.				
⅛ to ¾ inch	64	52	61½	49½
½ to 4 inches	71	59	68½	56½
4½ to 8 inches	67	55	64½	52½
Double extra strong plain ends, ½ to 8 inches	60	49	75½	49½

MERCHANT BOILER TUBES, CARLOADS, 22 FEET AND UNDER.

	Steel	Iron
1 to 1½ inches	44	41
1¾ to 2¼ inches	56	41
2½ inches	58	46
2¾ to 5 inches	64	53
6 to 13 inches	56	41

Less than carload lots two points less.
2½ inches and smaller, over 18 feet, 10 per cent net extra.
2¾ inches and larger, over 22 feet, 10 percent net extra.

Muck Bar.—Within the past week muck bar in quantities aggregating between 6,000 and 7,000 tons, with delivery running from prompt to first quarter, has been sold at prices averaging about $30. Some sold at $29, and others as high as $31.

Sheets.—There has been considerable buying at the advanced price announced last week by the leading interest, although the prices are for first quarter only on tin plate and 60 days on sheets. Another mill was placed in operation this week, and several others are being put in shape should conditions warrant their starting. A larger percentage of the mills are now running on both sheets and tin plate than at this time any other year. We quote as follows:

American Bessemer steel sheets, box annealed, cold rolled, one pass: Nos. 11-12, 1.90c; Nos. 13-14, 1.95c; Nos. 15-16, 2c; Nos. 17-21, 2.05c; Nos. 22-24, 2.10c; Nos. 25-26, 2.15c; No. 27, 2.20c; No. 28, 2.30c. Galvanized, Nos. 10-11, 2.25c; Nos. 12-14, 2.35c; Nos. 15-16, 2.45c; Nos. 17-

21, 2.60c; Nos. 22-24, 2.75c; Nos. 25-26, 2.95c; No. 27, 3.15c; No. 28, 3.35c. Corrugated roofing, 1.70c per square for No. 28, painted, 2½ in. corrugation; 2.95c per square for No. 28, galvanized, 2½ in. corrugation. Quotations f. o. b. Pittsburg for large lots.

Merchant bars.—The Republic Iron and Steel Co. this week announced an advance on common iron bars from 1.80c Youngstown, 1.85c Pittsburg, to 2c Youngstown, or 2.05c, Pittsburg. Hoops were also advanced to 1.85c on carload lots, or 1.95c on less than carload lots, plus regular hoop card extras. We quote:

Common iron bars, 2c, Youngstown; 2.05c, Pittsburg; hoops, 1.85c in carload lots, and 1.95c in less than carload lots, with regular hoop card for extras. Bands, 1.50c; Bessemer steel bars, 1.50c; open-hearth steel bars, 1.50c; plow and cultivator, 1.50c, net; channels, angles, zees and tees under 3 in., 1.60c, all f. o. b. Pittsburg. The following differentials are maintained on steel: Less than 2,000 lbs., 10c advance; less than 1,000 lbs. of a size, 30c advance.

Rails and Track Material.—While no further advance in prices has been announced, the demand for light rails continues to be very heavy. During the past week there has been but little going on as far as large orders for standard sections are concerned. Mills are booked ahead as far as next July. We quote:

Fifty pounds and heavier, 500-ton lots and over, $28; carload lots and less than 500 tons, $30; less than carload lots, $32; light rails, 16-lb., $29 to $30; 20 lb., $27.50 to $28; 25 to 45 lb., $26.50; angle bars for standard sections, 1.50c; spikes, $1.10 to $1.95.

Billets.—The scarcity of billets and the strong demand caused an advance of 50c on Bessemer billets this week, and they are now strong at $26.50, and open-hearth billets are quoted at $27 to $28. Sheet bars are nominally $27.

Skelp.—There have been but few transactions in skelp, and we continue to quote as follows:

Bessemer steel, grooved, 1.65c to 1.70c; sheared, 1.70c; open-hearth, grooved, 1.65c; sheared, 1.75c; iron, grooved, 1.70c; sheared, 1.75c to 1.80c.

Wire and Wire Nails.—Conditions in this market are good, and there are practically no mill stocks, and the stocks of jobbers are just about normal. The consumption has been heavy, but no advance in prices has been made. The interests have issued a circular against quoting jobbers' prices to large retailers. We quote as follows:

Wire nails, jobbers' carload lots, $1.80; retailers' carload lots, $1.85, and less than carloads, $1.95; painted barb wire, $1.95 for jobbers in carloads; retailers' carloads, $2, and less than carloads, $2.10, with 30c for galvanizing. Annealed smooth fence wire is held at $1.65, with the usual differentials to retailers for carloads and less than carloads. Quotations are all f. o. b. Pittsburg, 60 days, with 2 per cent. discount for cash in 10 days. Iron and steel cut nails, $1.70 to $1.75.

Merchant Steel.—With producers well sold up for several months ahead business is good and from $2 to $3 premium is being paid on both prompt and some future business. We quote as follows:

Cold rolled and ground shafting, 50 percent off in carload lots, and 45 off in less than carloads, delivered in base territory; tire steel, 1.70c; open-hearth spring steel, 2.25c to 2.50c; sleigh shoe flat, 1.50c to 1.55c; smooth finished machinery steel, 1.70c to 1.75c; toe calk, 2c to 2.05c.

Coke.—On account of a deluge of box cars in the Connellsville region and the accompanying betterment in shipping facilities, the price of foundry coke dropped during the early part of the week from $4 to $3.75 for prompt delivery, and furnace coke is quoted from $3 to $3.10. It is expected the former price will be regained as soon as the present surplus of cars is exhausted. On account of the large coke tonnage on the tracks in the vicinity of Chicago, prices there have dropped, as shippers have sold low in order to avoid car service charges. The production from the Connellsville region for the week ending November 18 was 274,736 tons, and from the lower Connellsville region 90,264 tons.

Old Material.—The scrap market during the week has been listless, and there has been but little buying by the mills, and then only as they actually need the scrap. We quote:

Heavy melting stock, $18 to $18.50; old steel rails, long lengths, $18 to $18.50; No. 1 cast scrap, $15 to $15.50; heavy cast scrap borings, $10.75 to $11; bundled sheet scrap, $15.50 to $15.75; No. 1 wrought scrap, $20.50 to $21; low phosphorous scrap, $20 to $21.

CHICAGO.

Plans of the United States Steel Corporation.—First Signs of Holiday Quiet.

OFFICE OF *The Iron Trade Review*,
1104 MONADNOCK BUILDING, Nov. 28.

The growing importance of Chicago as an iron and steel producing center is emphasized in the announcement made last week by the United States Steel Corporation that it will build a large steel plant in the vicinity of this city. A tract of land in Indiana, 2,500 acres in extent, located on the lake front several miles from South Chicago, has been acquired as a site for these works. The plans for the improvement of the property are yet in a nebulous state, but it is tacitly admitted they will include a rail mill, blast furnaces, and the other departments necessary to the manufacture of standard sections from Bessemer steel. It is also possible a bar mill and open hearth plant may be added, the output of the Milwaukee mills and the steel capacity of South Chicago being entirely inadequate to the Western demand for these products. Construction of the new works will be pushed with all rapidity, but it is not possible that any steel will be made there inside of two years at least.

The first symptoms of holiday dullness are apparent in the local market. New tonnage is of light volume, and, except for the heavier forms of material, specifications are not so insistent. December is the month in which inventory is taken by most metal consumers in the West, and producers look for a gradual decline in business until the end of the year. Structural, rail and bar mills, however, have experienced no relief from the congestion of specifications at their plants, in some cases these being 100 per cent. in excess of the firm's output. Several products were advanced during the week under review. Forging billets are now selling at a minimum of $35 Chicago; galvanized sheets have been raised $2 a ton; hard steel angles $2 a ton; pig iron, 50 cents a ton, and bar iron from 50 cents to $1 a ton. One local maker of the latter product is holding his price at 2 cents, but this is because he desires to shut off further inquiry. Alabama and Virginia irons are quoted at $15 and $16 furnace for No. 2 foundry, respectively, and are strong at these prices. The scarcity of Northern iron is becoming acute, and $20 for No. 2 foundry is asked on contracts for first half deliveries. Connellsville coke is without gain in strength, remaining at $3.75 ovens for standard 72-hour brands. Scrap is hardening and mill grades are higher.

Pig Iron.—The demand for iron has lost none of its insistency. The melt in this district is exceptionally heavy, every foundry running to its fullest capacity. Transactions in new tonnage have fallen off, but the market has lost none of its inherent strength. With the approach of the holiday season it is customary for trading to lag, and a gradual decline in business is looked for next month. All the iron

that can be shipped, however, is accepted by Western foundrymen, many requesting that their contract quotas be anticipated. Prices are firm. Birmingham irons can still be bought on the basis of $14.50 for No. 2 foundry, but these offerings are usually of a high phosphorous character. For the better known brands $15 Birmingham is asked. Virginia furnaces have raised their prices 50 cents a ton, and are now quoting No. 2 foundry at $16 furnace, or $18.65 Chicago. The car scarcity in that district is very acute and some stacks are facing an accumulation of iron in their yards, for which there is a pressing need. Northern irons have not abated one jot of their strength during the week. The tightly sold condition of all the local furnaces is gradually forcing prices upward. No. 2 foundry is now quoted at $20 Chicago, though here and there some spot iron can be picked up at $19.50. No relief can be expected from Valley furnaces, as the delivered price of these irons is higher than local quotations. Malleable Bessemer is especially scarce, and $20 Chicago is the absolute minimum at which it can be bought. High silicon irons have advanced 50 cents a ton, and Southern car-wheel $1 a ton. Lake Superior charcoal is gaining in strength, and an advance from the present level is daily expected. We have revised our prices, and quote as follows:

Lake Superior charcoal	$20.00 to 20.50
Northern Foundry No. 1	20.50 to 21.00
Northern Foundry No. 2	19.50 to 20.00
Northern Foundry No. 3	19.00 to 19.50
Northern Scotch Foundry	20.50 to 21.00
Ohio Strong Softeners No. 1	20.30 to 20.80
Ohio Strong Softeners No. 2	19.80 to 20.30
Southern Foundry No. 1	18.65 to 19.15
Southern Foundry No. 2	18.15 to 18.65
Southern Foundry No. 3	17.65 to 18.15
Southern Foundry No. 4	17.40 to 17.90
Southern No. 1 Soft	18.65 to 19.15
Southern No. 2 Soft	18.15 to 18.65
Southern Gray Forge	16.65 to 17.15
Southern Mottled	16.40 to 16.65
Southern Silveries (4 per cent to 6 per cent Silicon)	18.65 to 19.15
Jackson Co. Silveries....6%, 20.30; 8%, 21.30; 10%,	22.30
Alabama and Georgia Car Wheel	22.65 to 23.15
Malleable Bessemer	20.00
Basic Iron	18.65 to 18.90

Billets.—The current demand for forging billets is limited only by the capacity of the local mill. As this interest is conserving its unsold tonnage, the volume of business is not large. Prices are very firm, $35 Chicago for all sizes up to but not including 10x10 being the minimum quotation. Wire rods are also strong at $33 Pittsburg and chain rods at $35.

Bars.—In the volume of new business closed, the week was a light one. Specifications are the predominating feature of the present market, and these are very heavy for both iron and steel bars. Western mills are glutted with them, especially for the smaller sizes of bars and angles; and it will be months before they can hope to catch up with the orders on their books. Bar iron continues to reach for higher levels in values, one local maker now asking 2 cents. This is an exceptional price, however, and was made to shut off further inquiry, the general market ranging from 1.90c to 1.95c Chicago. Hard steel angles are very firm and have advanced $2 a ton. For quick shipment of soft steel bars and shapes, premiums are easily obtained. Regular quotations for carload lots, mill shipments, Chicago delivery, are without change, as follows: Soft steel bars and bands, 1.66½c, half extras; soft steel angles, less than 3x3, 1.76½c; hoops, 1.91½c, base, full extras; hard steel angles, 1.70c to 1.80c. Demand from store is good and prices are firm. Jobbers report that owing to the congested condition of mills, demand for steel bars from stock is very active. Under the frequent offers of premiums, prices for immediate shipment are stiff and high and a new schedule has gone into effect. We quote warehouse shipments as follows: Bar iron, 2.20c to 2.25c; soft steel rounds and squares, 2 in. and larger, $2 per 100 lbs. base; flats, 2 in, and 4 in. x 1⅛ in. and thicker, $2 per 100 lbs. base; flats, 4½ in. x 5 in. and 6 in. x 5-16 in. and thicker, $2 per 100 lbs. base; all ovals, half ovals and half rounds, $2 per 100 lbs. base. Other sizes not mentioned above, $1.85 per 100 lbs. base, plus half extras.

Sheets.—An advance of $2 a ton was made in galvanized sheets at the time black sheets were raised a week ago, but was not announced in our last report owing to an oversight. Corrugated sheets were also advanced 10c a square. The galvanized product is now selling on the basis of 3.51½c Chicago for No. 28 gauge, but with the $1 rebate which is usually offered on 85 per cent. of the season requirements the net price to the consumer is 3.46½c. Black sheets are selling on the same basis, No. 28 gauge being offered at 2.30c Pittsburg for spot shipment and 2.25c on season contracts, making the local price 2.41½c to 2.46½c. These prices are still considered low by makers in comparison with the cost of sheet bars, which are selling at $27.50 to $28 Pittsburg, and further advances are looked for at an early date. We have revised our prices and quote carload lots, mill shipments, Chicago delivery, as follows: Blue annealed, Nos. 9 and 10, 1.76½c to 1.81½c; Nos. 11 and 12, 1.81½c to 1.86½c; Nos. 13 and 14, 1.86½c to 1.91½c; Nos. 15 and 16, 1.96½c to 2.01½c. Box annealed, Nos. 18-20, 2.16½c to 2.21½c; Nos. 22-24, 2.21½c to 2.26½c; Nos. 25 and 26, 2.26½c to 2.31½c; Nos. 27, 2.31½c to 2.36½c; No. 28, 2.41½c to 2.46½c; No. 29, 2.55½c to 2.61½c.

The movement from warehouse stocks is active and store prices are firm, as follows: No. 10, 2c to 2.10c; No. 12, 2.05c to 2.15c; No. 14, 2.10c to 2.20c; No. 16, 2.20c to 2.30c; Nos. 18-20, 2.40c to 2.50c; Nos. 22-24, 2.45c to 2.55c; No. 26, 2.50c to 2.60c; No. 27, 2.55c to 2.65c; No. 28, 2.65c to 2.70c; No. 30, 3.15c to 3.35c. Revised quotations on galvanized sheets, mill shipments, carload lots, Chicago delivery, are as follows: Nos. 10 and 11, 2.36½c to 2.41½c; Nos. 12-14, 2.46½c to 2.51½c; Nos. 15 and 16, 2.56½c to 2.61½c; Nos. 17-21, 2.71½c to 2.76½c; Nos. 22-24, 2.86½c to 2.91½c; No. 26, 3.06½c to 3.11½c; No. 27, 3.26½c to 3.31½c; No. 28, 3.46½ to 3.51½c. From store, galvanized sheets are quoted as follows: Nos. 10-12-14, 3c to 3.10c; Nos. 16-18-20, 2.90c to 3c; Nos. 22-24, 3.05c to 3.15c; Nos. 26, 3.25c to 3.35c; No. 27, 3.45c to 3.55c; No. 28, 3.65c to 3.75c.

Structural Steel.—New business is light because of the inability of mills to give reasonably early deliveries. All makers are loaded with specifications against old contracts, in some instances these being from 50 per cent. to 100 per cent. in excess of the output. Premiums of $3 a ton are cheerfully paid for quick shipments, but only in exceptional instances can these be secured. Prices are without change, mill shipments, Chicago delivery, being as follows: Beams and channels, 3 to 15 in., inclusive, 1.86½c; angles, 3 to 6 in., 1.86½c; angles, larger than 6 in., on one or both legs, 1.96½c; beams larger than 15 in., 1.96½c; zees 3 in. and over, 1.86½c; tees 3 in. and over, 1.91½c; with the usual extras for cutting to exact lengths, punching, coping, bending, or other shop work. Jobbers report great difficulty in keeping their stocks replenished, and because of delayed shipments from mills are forced to pick up odd lots wherever possible. This has resulted in many changes to store prices, it being impossible to maintain any regular schedule under present conditions. Present quotations are as follows: All angles, 3 in. and larger, $2.25 per 100 lbs. base; tees, 3 in. and larger, $2.30 per 100 lbs. base; 3, 5, 9, 12 and 15 in. beams, $2.25 per 100 lbs. base; 4, 8 and 10 in. beams, $2.50 per 100 lbs. base; 6, 7, 18, 20 and 24 in. beams, $2.75 per 100 lbs. base; 3, 4, 9, 12 and 15 in. channels, $2.25 per 100 lbs. base; 6, 7, 8 and 10 in. channels, $2.50 per 100 lbs. base; 5 in. channels, $2.75 per 100 lbs. base.

Plates.—Nothing of importance has developed during the week under review. Specifications and new tonnage are of fair proportions. January shipments can be given by the local mill on new contracts, which is significant of the de-

mand for this product. Prices for carload lots, mill shipments Chicago delivery, are as follows: Tank steel, ¼ in. and heavier, up to 100 in. wide, 1.76½c base; flange steel, 1.86½c base; marine steel, 1.96½c base; all full extras. Plates, 3-16 in. thick, $2 extra; gauges, 7 to 8, $3 extra; No. 9, $5 extra. Less than carload lots, $5 extra. Local jobbers report a stiff demand from stock and prices are very firm. We quote tank steel, ¼ in. and heavier, up to 72 in. wide, 2c to 2.10c; 72 in. to 96 in. wide, 2.10c to 2.20c; 3-16 in. up to and including 60 in. wide, 2.10c to 2.20c; 3-16 in., 72 in. wide, 2.35c to 2.45c; No. 8, up to 60 in. wide, 2.15c to 2.25c; flange steel, 25c extra; heads, 25c extra.

Rails and Track Supplies.—Contracting for standard sections is of light volume, the week being marked by only a few sales of small lots to several interurban and steam railroads. Light rails are improving in tonnage, and November will compare favorably with other months in the aggregate volume of sales. Last week they amounted to 11,000 tons, 3,000 tons of which were for export. Quotations are unchanged. Heavy sections in 500-ton lots, f. o. b. mill, $28; less than 500 tons to car lots, $30; less than carload lots, $32. Light rails, f. o. b. Milwaukee, mill: 12-lb. sections, $31; 16-lb., $30; 20-lb., $29; 25-lb., $28; 30, 35, 40 and 45-lb. sections, $26.50. Track supplies, f. o. b. Joliet, are as follows: Angle bars, 1.50 to 1.75c, according to tonnage; spikes, first quality, 1.85c to 1.95c; track bolts, 3¼x¾, with square nuts, $2.50 to $2.60 per 100 lbs.; with hexagon nuts, $2.65 to $2.80.

Merchant Steel.—Leading makers continue out of the market, and there is nothing of importance to chronicle. Specifications are very heavy, constantly exceeding the capacity of mills. Prices are firm, carload lots, mill shipments, Chicago delivery, being quoted as follows: Spring steel, 2.10c; sleigh shoe, flat sizes, 1.71½c; concave and convex, 1.86½c; cutter shoe, 2.35c to 2.40c; smooth finished machinery steel, 1.91½c; smooth finished tire, 1.86½c; plow steel, 2.20c and upward, according to quality; toe calk steel, 2.21c; railway spring, 1.86½c. Cold rolled shafting 50 and 2½ per cent. off to dealers, 50 per cent. off in carload lots, and 45 per cent. in less than carload lots. Crucible tool steel, 6½c to 8c; special grades of tool steel, 13c and up.

Cast Iron Pipe—Routine business is light. The only contract of importance to come up this week is that of the city of Portland, Ore., for 4,000 tons, which will be let to-day. A number of inquiries have been withdrawn owing to the high prices of pipe, which are not expected to come up again until the market is lower by a few points. Prices are without change, and we quote carload lots, f. o. b. Chicago: 4-in. water pipe, $31; 6, 8, 10 and 12-in., $30; larger sizes, $29.50; gas pipes, $1 extra.

Boiler Tubes.—Demand continues good for all sizes. Specifications are heavy and shipments from mills slow. Prices are without change. We quote carload lots, Chicago delivery, as follows:

	Steel.	Iron.	Seamless.
1 to 1½ inches	40.35	37.35	53.00
1¾ to 2¼ inches	54.35	39.35	40.00
2½ inches	56.35	44.35	43.00
2¾ to 5 inches	62.35	51.35	
Up to 4½ inches			50.50
6 to 13 inches	52.35	37.35	

Less than carload lots, from store, as follows:

	Steel.	Iron.	Seamless Steel.
1 to 1½ inches inclusive	40	35	42½
1¾ to 2¼ inches, inclusive	50	35	35
2½ inches, inclusive	52½	35	30
2¾ to 5 inches, inclusive	60	47½	42½

Wire Products.—There is a uniform adherence to the present rate card since the meeting of a week ago. Demand is of active proportions, especially from the Southwest. We quote carload lots, mill shipments, Chicago delivery, to jobbers, as follows: Wire nails, $1.95; painted barb wire, $2.10; galvanized barb wire, $2.40; smooth annealed wire, $1.80; smooth galvanized wire, $2.10; polished staples, $2.10; galvanized staples, $2.35. Carload lots to retailers, 5 cents higher than above prices; less than carload lots, 15 cents higher are quoted.

Merchant Pipe.—The favorable weather conditions prevailing at the present time have been a stimulant to the consumption of pipe. All merchant sizes are in good demand, and jobbers are sending in supplementary orders more frequently than ever before at this time of the year. Prices are without change. We quote carload lots, f. o. b. Chicago, ⅜ to 6-in. black steel pipe, 78.35 per cent. discount from list. From stock, jobbers' discounts are 76½ to 77 per cent.

Coke.—Trading in coke is light. Inquiry is mainly for spot shipment, for which prices are 25 cents a ton lower than on contract deliveries. Local receipts of coke are ample for Western needs, owing to the open weather that continues to prevail, and demurrage fuel is a bar to a stronger market. Both Wise County and Solvay cokes are scarce, little of either being offered for sale in this city. Connellsville 72-hour brands are offered at $3.75 ovens for immediate shipment, and $4 on contracts.

Old Material.—The faith that is displayed by dealers and sellers of scrap in the future of the market is largely responsible for the present high prices. They are not warranted by the volume of trading, nor by any known scarcity of material in this district, all the large consumers being amply protected and none buying very freely under present conditions. The market, nevertheless, is firm, and prices have a strong advancing tendency. Old steel rails, railroad wrought, busheling, has each been advanced. We have revised our prices and quote gross tons as follows:

Old Steel Rails (4 feet and over)	$17.25 to 17.75
Old Steel Rails (less than 4 feet)	16.50 to 17.00
Old Iron Rails	23.00 to 23.50
Relaying Rails, subject to inspection	26.50 to 27.00
Heavy Melting Steel	15.00 to 15.50
Mixed Country Steel	12.50 to 13.00

For net tons we quote as follows:

No. 1 R. R. Wrought	$17.75 to 18.25
No. 2 R. R. Wrought	17.25 to 17.75
Shafting	18.00 to 18.50
Dealers' Forge No. 1	14.50 to 15.00
Wrought Pipe and Flues	12.50 to 13.00
No. 1 Cast, 150 lbs. and less	14.50 to 15.00
No. 1 Mill	9.50 to 10.00
No. 1 Busheling	13.00 to 13.25
Mixed Busheling	12.25 to 12.75
Country Sheet	8.50 to 9.00
No. 1 Boilers Cut	12.50 to 13.00
Boiler Punchings	15.00 to 15.50
Iron Car Axles	23.50 to 24.00
Steel Car Axles	19.00 to 19.10
Iron Axle Turnings	11.50 to 12.00
Cast Borings	10.00 to 10.50
Mixed Borings, etc	10.00 to 10.50
Machine Shop Turnings	11.75 to 12.25
Railroad Malleable	15.00 to 15.50
Agricultural Malleable	14.00 to 14.50
Stove Plate and Light Cast Scrap	12.00 to 12.50
Old Iron Splice Bars	19.50 to 20.00

Improvements of N. & G. Taylor Co.—The N. & G. Taylor Co., Philadelphia, is putting in additional equipment at its Cumberland rolling mills for the manufacture of soft steel billets in the lighter sections up to 3½ in. square. This addition was made possible by recent increases in the steel-making capacity of the plant and further improvements are planned to enlarge the output of sheet and tin-bar for its own requirements and billets for the trade. The improvements will be in operation by the end of the year.

President Cooper of the Republic Iron and Steel Company would neither confirm nor deny the report widely printed that the Standard Oil Company is negotiating for the purchase of the oil properties of his company. The Republic is the largest single oil producer in the Muncie (Ind.) field, its average daily production being now about 2,000 barrels. It has about 200 wells in operation and has under lease about 7,000 acres of valuable undeveloped territory. It is stated that the Standard Oil Company has offered the Republic $2,000,000 for its properties in this region.

CINCINNATI.

Market is Quiet with Little Buying at Present or In Prospect.—Car Shortage.

November 28, 1905

Pig Iron.—The market has ruled quiet the past week with but little buying and no inquiry of importance. Prices have made no change and the expected lull in activity appears to have arrived. Buyers now seem to be supplied for their present and future requirements for the coming three or four mouths and furnaces have their order books in good condition for a like period. Comment on the situation among the sales agencies indicates expectation of a run of small orders until after the first of the year when consumers are expected to interest themselves in their second and third quarter requirements. One inquiry has come to the surface for 2,000 tons of southern iron for delivery over the last half of next year and it is reported that a sale was made in the Valley on the basis of $17.00 furnace for last half delivery. There is but little that is new in the situation and southern iron is still obtainable at $14.00 Birmingham for No. 2 with some large interests asking $14.50. One important southern interest that has been out of the market for several weeks is now authorizing its selling agents to take desirable business on the $14.00 basis. Southern Ohio furnaces are mainly asking $18.00 for No. 2 at furnace but $17.50 can be done.

The shortage of railroad equipment is hampering the movement of pig iron from the south and furnaces are unable to keep up with their deliveries. The constant calls for iron on contracts by consumers is taken as an indication that consumption is keeping up at a high rate. The shortage of cars in the coke fields is expected to interfere with furnace operations in the south, but northern furnaces located on lines of railroad reaching coke ovens over their own rails are keeping their furnaces in fairly regular supply.

Southern Foundry No. 1	$17.25 to 17.75
Southern Foundry No. 2	16.75 to 17.25
Southern Foundry No. 3	16.25 to 16.75
Southern Foundry No. 4	15.75 to 16.25
Southern Foundry No. 1, soft	17.25 to 17.75
Southern Foundry No. 2, soft	16.75 to 17.25
Gray Forge	15.75 to 16.00
Northern Foundry No. 1	19.15 to 19.65
Northern Foundry No. 2	18.65 to 19.15
Northern Foundry No. 3	18.15 to 18.65
Jackson County Silvery, 8 percent	20.15 to 20.65
Southern Charcoal	19.75 to 20.25

Finished Material.—The demand continues good for practically all descriptions and the market is firm. We revise quotations on sheets to conform to the recent advance of $1.00 per ton. Bar iron remains steady. Bar iron is quoted at 1.70c to 1.75c; steel bars at 1.63c, half extras with dealers quoting 1.85c for iron and steel out of store. Galvanized sheets No. 10 and No. 12, in car lots are 2.48c. We quote black sheets, No. 27 at 2.30c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 2.75c; No. 27, 2.65c; No. 16, 2.25c; No. 14, 2.15c; No. 12, 2.05c. Tank plates are firm and sell out of store at 2c for ¼-in. and 2.10c for 3-16, Nos. 8 and 10. Beams and channels are quoted at 2.25c to 2.50c from stock and angles at 2c to 2.05c for base sizes.

In merchant pipe the demand continues good but prices are still somewhat irregular although independent mills are reported to be approaching the schedule of the leading interests on most sizes. We quote f. o. b. Cincinnati:

MERCHANT PIPE.

(Basing Discounts.)

	Steel Pipe.		Guaranteed Wrought Iron Pipe.	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛ and ¼ inches	69.7	53.7	67.2	51.2
⅜ and ½ inches	73.7	61.7	71.2	59.2
¾ to 6 inches	77.7	67.7	75.7	65.7
7 to 12 inches	72.7	57.7	70.7	55.2

Coke.—There has been no change in prices and the car situation continues to be the interesting feature in the market for this commodity. Complaint is especially notable in the Virginia fields. The movement from the Connellsville district has not as yet been seriously disturbed. It is difficult to obtain equipments to pass from point of origin to connecting lines. Thus the movement of coke from southern fields to northern markets is seriously interfered with. Prices at the various coke producing districts are as follows:

†Wise County, Va. Furnace Coke prompt shipment.	$ 3.00 to 3.25 per ton
Wise County, Va. Foundry Coke prompt shipment.	4.00 per ton
Pocahontas Furnace Coke on contracts	
Pocahontas Foundry Coke on contracts	
Connellsville Furnace Coke prompt shipment	3.00 to 3.25 per ton
Connellsville Foundry Coke prompt shipment	3.90 to 4.25 per ton
New River Foundry Coke on contracts or prompt ship't.	3.75 per ton
New River Furnace Coke, prompt shipment	3.00 per ton

†Wise County, Va., Coke on Furnace contracts is sold mainly on a sliding scale basis for pig iron prices on the following basis: $1.65 per ton on $9.00 pig iron, plus 17 percent of the advance on pig iron above $9.00 Birmingham.

Old Material.—The market remains firm and fairly active with no important change in prices. We quote f. o. b. Cincinnati:

Old No. 1 railroad wrought, net tons	$17.50 to 18.00
Cast machine and foundry, net tons	14.00 to 14.50
Old iron rails, gross tons	23.50 to 24.00
Old steel rails, gross tons	16.50 to 17.00
Old short lengths, gross tons	17.50 to 18.00
Old iron axles, net tons	23.50 to 24.00
Stove plate, net tons	10.50 to 11.00
Wrought turnings, net tons	11.00 to 12.00
Cast borings, net tons	9.00 to 9.50
Car wheels, net tons	16.50 to 17.00

CLEVELAND.

Large Sales of Ore at Advanced Prices.—Higher Freight Rate on Ore.—Expected Advance in Pipe.

OFFICE OF *The Iron Trade Review*,
BROWNING BUILDING, November 28.

Iron Ore.—Very large sales of iron ore have been made during the past week at an advance of 50 cents over the quotations of the beginning of this year. Very few furnace interests have shown any hesitation; on the contrary, some sellers report that orders have already been placed for about all the high grade Bessemer ores they have to dispose of. At the present rate at which ores are being contracted for, there will be very little available by Dec. 15. The prevailing prices are as follows: Old range Bessemer, $4.25; Mesabi Bessemer, $4.00; old range non-Bessemer, $3.70; Mesabi non-Bessemer, $3.50.

A few shippers have chartered vessels on the basis of $1.00 at the head of the lakes, an advance of 25 cents over the season rate. There has, however, been little wild ore, and it is not expected that there will be much during the few remaining days of the season.

Pig Iron.—There is very little buying at present, as nearly all buyers are covered through the first quarter of 1906, and many have provided for their requirements for the first half, while neither buyers nor sellers are anxious to do business for the second half. There is very little foundry iron to be had in Cleveland or the valleys, and nearly all sellers are asking $18. It is possible that this quotation might be shaded, but if transactions were made at a lower figure, they would be very exceptional. Basic and Bessemer are quoted at $17.25 to $17.50 at the furnace. Cast iron pipe interests are inquiring for considerable tonnage of No. 3 foundry, but it also is very scarce, and probably could not be purchased at less than $17.50. We quote f. o. b. Cleveland as follows:

Bessemer	$18.35 to 18.85
No. 1 Foundry	18.50 to 19.00
No. 2 Foundry	18.00 to 18.85
No. 3 Foundry	17.50 to 18.00
No. 2 Southern	17.85 to 18.35
Gray Forge	16.85 to 17.35
Gray Forge, Southern	15.85 to 16.35
Lake Superior charcoal	19.00 to 19.50

Finished Material.—The quotation on bar iron has been advanced to 2 cents per pound, which makes iron $10.00

per ton higher than steel. The bar iron mills are sold far ahead as a rule, but it is not expected that much iron will be sold at the very high price which has just been announced. Wherever steel can be used in place of iron, that is being done, and this tendency will become more marked as long as the wide difference in the price of the two products prevails. There is a strong demand for steel at 1.50c, and the mills are so well supplied with orders that it is impossible to give prompt shipment. The demand for merchant pipe has improved, and some independent interests which have been eager for business and have taken orders at quotations below the announced prices, are now advancing their prices, and it is expected that the principal producer will soon announce an advance. The advance in sheets announced last week has not been strictly adhered to in all cases. One seller stated that although he had not asked the new prices, he had lost business through competitors.

Old Material.—The market continues strong but without features. Heavy melting steel is in good demand. We quote, Cleveland delivery, as follows:

Old Iron rails	$25.00 to 26.00
Old steel rails (over 6 feet	16.00 to 17.00
Old steel rails (under 6 feet)	17.00 to 18.00
Old car wheels	17 00 to 17 50
Steel boiler plate	14.00 to 15 00
Steel axles	20.00 to 21.00
Malleable iron (railroad)	16.00 to 17.00
Malleable iron (agricultural)	15.00 to 16.00
Heavy steel	17.00 to 17.50

We quote as follows, net tons:

No. 1 R. R. wrought	17.50 to 18.00
No 1 busheling	14.00 to 15 00
No. 1 machine cast	13.75 to 14 25
Iron axles	22.50 to 23.50
Axle turnings	11 50 to 12.50
Wrought turnings (free from cast)	11.00 to 12.00
Grate bars	9.00 to 9 50
Pipes and flues	13 00 to 14.00
Tank iron	11.00 to 11 50
Hoop and band iron	8.00 to 9 00
Sheet iron	7.00 to 8 00
Wrought drillings	11 00 to 12 00
Stove plate	10.50 to 11.00
Cast borings	8.50 to 9.50

PHILADELPHIA.

Pencoyd Works Supplied with Basic Pig from Bethlehem.—Increased Blast Furnace Capacity.

November, 28, 1905.

Pig Iron.—There is little change in either prices or business conditions to be noted during the past week. While there is still a disposition to look upon $20 iron as almost inevitable later on, the fact remains that just at present production is proceeding at an enormous rate, almost, if not quite exceeding consumption, and that a month of magnificent weather has enabled the railroads to meet transportation problems in a fairly satisfactory manner. Prices continue very firm, but under present conditions there is no desire to mark them up. A stormy December may, of course, tell a very different tale. The local situation may be said to be improved by the blowing in of the Carbon Iron & Steel Co.'s furnace at Perryville, which was out for some time, and by the progress of repairs on the two stacks of the Swede furnaces at Swedeland. Indeed, more blast furnaces are now said to be in operation in Eastern Pennsylvania than for a long time. The purchase of western Bessemer iron by the Midvale Steel Co. has been followed by the announcement that the Bethlehem Steel Works has sold 8,000 tons of basic to the Pencoyd Works of the American Bridge Co., at a price said to be $17.75. Much of the iron for this plant has heretofore come from the Pittsburg furnaces of the United States Steel Corporation, and the fact that it has now turned to eastern iron is regarded as significant as showing a much greater scarcity in western territory than in the east. Prices, which show little change, may be quoted as follows: $18.50 for No. 2 X foundry being still taken as the market basis.

No 1X Foundry	$19.00 to 19.25
No. 2X Foundry	18.50 to 18.75
No. 2 Plain	18.00 to 18.25
Standard Gray Forge	16.50 to 17.00
Basic	17.75 to 18.25
Low Phosphorus	24.00 to 24.50
Southern No. 2X, rail	18.00 to 18.50
Southern No. 2X, dock	17.50 to 18.00

Finished Material.—The demand upon the mills for practically all lines is now so steady and continuous that little change seems likely for some time. Large supply houses are compelled to draw heavily upon stock to meet demands of customers and find it difficult to keep up all lines. Prices, which are in some respects nominal, remain as before quoted: Beams, channels and angles, according to specification, 1.82½c to 2.50c; refined iron bars, 1.75c to 1.85c; steel bars, 1.63½c to 1.83c; plates, 1.73½c to 1.83½c.

Old Material.—Purchases of scrap by the mills are reported less urgent, but a fair business is being done. An increased demand for cast borings and stove plates show that more low priced material is being used. Prices may be quoted as follows:

Old steel rails	$18.25 to 18.50
No. 1 steel scrap	18.00 to 18.25
Old steel axles	21.50 to 22.00
Old iron axles	26.00 to 26.50
Old iron rails	23.00 to 24.00
Old car wheels	17 50 to 18.00
Choice scrap, R. R. No. 1 Wrought	22.00 to 23.50
No. 1 yard scrap	20.00 to 21.00
Machinery scrap	16.50 to 17.00
Low phosphorus scrap	22.00 to 23.00
Wrought iron pipe	16.50 to 17.00
No. 1 forge fire scrap	15.50 to 16.50
No 2 forge fire scrap, ordinary	13.25 to 13.75
Wrought turnings	15 00 to 15 50
Axle turnings, heavy	15.50 to 15.00
Cast borings	10.50 to 11.25
Stove plate	13.25 to 13.75

NEW YORK.

Prices Firm and Rising and Consumption at Maximum Rate.—Renewed Activity in Structural Materials.—More Rail Orders.

OFFICE OF *The Iron Trade Review*, ROOM 1815, No. 150 NASSAU ST., November 27.

Pig Iron.—Sales have been comparatively light during the past week, although the demand continues to show undiminished activity. The result is an extremely strong market and advancing prices. So many producers are out of the market that practically all the local agents are ready to buy any small lots offered for importunate customers. One such lot of Eastern Pennsylvania No. 2 foundry was secured at $18, furnace, and another will cost the consumer $19.50 delivered. An offer of $14.50, Birmingham, for No. 2 Alabama iron in a 500-ton lot was flatly refused. This morning the representative of Buffalo furnaces announced another advance of 50 cents per ton. In the local trade very little has been done in steel irons, but the foundry list will probably foot up to 10,000 tons. The reports of heavy contracts placed by pipe works—some 40,000 or 50,000 tons of foundry and mill of both Southern and Northern production—aroused a great deal of interest although it is understood that the actual sales were not effected in the city and details are withheld. The pipe to be put down by the New York water supply department in the near future will absorb many thousand tons of iron. The department last week received bids on 30,700 tons of straight pipe, and 3,315 tons of special castings and 305 tons of steel castings, the sizes running from 6 to 24 inches. Prices of ferro-manganese and spiegel have made a remarkable advance and for spot delivery these grades are practically unobtainable. There are the usual inquiries from the larger consumers, the pump works calling for bids on a lot of 800 tons and 3600 tons, the latter divided into high silicon and medium grades. The General Electric Company issued inquiries for 400 tons of Northern No. 2. foundry and other melters in New England and New Jersey make up a total of more than 4000 tons more.

Charcoal and malleable are extremely scarce, as are also all other grades, the question being less one of finding buyers than of securing material to sell. The following are prices at tidewater:

Northern No. 1 Foundry	$18.75 to 19.25
No. 2 Foundry	18.00 to 18.75
No. 2 Plain	17.50 to 18.00
No. 1 Southern Foundry	18.75
No. 2 Southern Foundry	18.00
No. 3 Southern Foundry	17.25 to 18.00
No. 4 Foundry	17.00 to 17.25

Pig Iron Certificates.—Trading in pig iron certificates on the New York Produce Exchange has been fairly active and prices rule higher. Sales aggregating about 5000 tons were effected during the week. Foundry iron warrants follow:

	Bid.	Asked.
November	17.15	17.60
December	17.25	17.75
January	17.35	18.00
February	17.45	18.00
March	17.45	18.00

Finished Iron and Steel.—Transactions in finished materials have been somewhat heavier than during the weeks immediately preceding the last. Several contracts which had been pending for some time were released and many new inquiries were received. The American Bridge Co. expects to book at least twice as large a tonnage during the present month as it secured in October. The firm has finally been awarded the contract for 30,000 tons of steel for bridges on the Harriman lines and has also secured an order for 8000 tons of steel for the Northwestern elevated structure at Chicago. Inquiries from other roads aggregate 10,000 tons more, and calls for shapes for buildings aggregate fully the same amount. Transactions in rails have been considerable, the largest recent orders being for 17,000 tons for the Gould lines and 18,000 for the Lehigh valley. A contract for 50,000 tons is temporarily held up. Business in plates and bars has not been heavy, but a fair movement is reported. Small lots of structural material are still commanding good premiums and contracts for considerable tonnages have recently gone abroad. The City & County Contract Co., which is building the Westchester line, is prepared to let contracts for 16 bridges, all of which will be of steel.

The following are prices at tidewater: Angles, 3 to 6 in. x ¼ in. and heavier, 1.84½c; beams, 3 to 15 in., 1.84½c; tees, 3 x ¼ in. and heavier, 1.89½c; plates, carloads, tank, 1.74½c; flange, 1.84½c; marine and ordinary fire box, 1.94½c; refined iron bars, 1.84½c; soft steel bars, 1.64½c to 1.79c; sheets in car load lots New York, black, 2.40c.

Old Materials.—The market shows continued strength consumers being willing to contract in some cases for a year in advance, and holders content to hold their stocks for the present. The railroads are the principal sellers and the accumulations of the Pennsylvania and the Reading have been disposed of during the week at full prices, the greater portion of the material, it is reported, being taken by mills along these lines. About 1000 tons of wrought scrap were sold in the Eastern market at prices above current quotations and about 750 tons of heavy melting steel scrap were delivered to a mill in Eastern Pennsylvania. The following are prices at tidewater approximately:

Old iron rails	$21.00 to 22.00
Old steel rails, long lengths	15.50 to 16.00
Old steel rails, short pieces	15.00 to 15.50
Relaying rails	23.00 to 24.00
Old car wheels	16.00 to 16.50
Old iron car axles	24.00 to 25.00
Old steel car axles	19.00 to 19.50
Heavy melting steel scrap	15.50 to 16.00
No. 1 railroad wrought scrap	20.00 to 21.00
Iron track scrap	18.50 to 19.00
Wrought pipe	14.00 to 15.00
Cast borings	10.00 to 10.25
Wrought turnings	14.50 to 15.50

BIRMINGHAM.

Tennessee Company will Erect Two New Furnaces.—Ensley Steel Production.

Birmingham, Ala., Nov. 27.—Alabama pig iron manufacturers have been considering a little business for delivery during the latter part of the first quarter of the coming year and into the second quarter. The amount of iron to be sold, however, for those periods is not very extensive and for that reason no orders are being given much consideration under $14.50 per ton, No. 2 foundry. A few sales have been made recently in this district for delivery next year.

The Tennessee Coal, Iron & Railroad Co. will hardly blow in its Alice furnace, (in the city) until after the first of the coming year. The Woodward and Republic companies both have furnaces ready for the torch. The Sloss-Sheffield Steel & Iron Co. has six furnaces in operation while the Alabama Consolidated Coal & Iron Co. has three stacks in blast.

It is announced that the Tennessee Coal, Iron & Railroad Co. will build two brand new furnaces in this district. That company is now rebuilding its No. 5 furnace at Ensley, which can be considered a new furnace when completed. Don Bacon, president of the Tennessee Company, has just returned from a trip to New York, where he went to confer with directors in the company. The announcement was made a few weeks ago that the Tennessee Company would erect a large cast iron pipe plant at Ensley.

The Williamson Iron Co. will shut down its foundry and machine shops in this city just as soon as existing contracts can be filled or otherwise disposed of. The company has sold its property to the Illinois central railroad for depot and terminal purposes and on Jan. 1 the bonds and stock of the Williamson Company, of which Frederick Dimmick is president, will be redeemed.

The production of steel at the Ensley plant, T. C. I. & R. R. Co., for the month of November will go over 23,200 tons, the largest month's production since the plant has been in operation. C. A. Durfee, who came here from the Colorado Fuel & Iron Co., is proud of the record being made during his first month's service with the company. Further improvements are being made at the steel plant and uncomfirmed reports have it that several more open hearth furnaces are to be added to the plant during the coming year in order to increase the output as much as possible.

The Metal Market.

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1315, No. 150 NASSAU ST., November 28.

Copper.—Although statistics show some accumulation of stocks prices have again advanced. Exports have been unusually light. Today's closings follow: Lake and electrolytic, 17½ to 17¾; casting, 17 to 17½; London's closing today: £77 15s and £77. Exports for the month to date, 9,234 tons.

Lead.—The market continues strong with a good demand and light offerings. Today's closings: 5.75c; St. Louis, 5.50c; London £15 12s 6d.

Spelter.—Prices for refined spelter are firm and the demand is fairly active. Today's closings: 6.15c to 6.25c; St. Louis, 6.00c; London £28 12s 6d.

Antimony.—There has been a better demand and firmer market. The following are today's quotations: Cookson's, 12½c to 13c; Hallett's, 12 to 12½c; Japanese, nominal, and other grades, 11½c to 12c.

Pig Tin.—A strong tone prevailed during the week, prices advancing some 4 points in the local market in sympathy with that of London. The consuming demand

outside of one or two large interests has been only moderate. Today's quotations follow. Spot November 33¾ to 34c; December 33.55 to 33.95; London £155 and £154 5s. Arrivals for the month to date, 2,610; afloat 1,955.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1164 MONADNOCK BUILDING, Nov. 28.

All metals are in strong demand and prices are very firm. Melters are covering freely for future requirements and contracting in the week under review has been very active. Copper and pig tin are higher. We quote prices as follows: Lake copper, in carload lots, 18½c to 18¾c, and in small quantities, 18¾c to 10c. Casting copper, 18¼c to 18½c for carloads, and 18½c to 18¾c for less than carload lots. Tin, 34½c to 34¾c for carload lots. Spelter, 6.05c to 6.10c for carloads, and 7c to 7¼c for lesser quantities. Pig lead, 5¼c for 50-ton lots, and 6¼c to 6¾c for carload lots, with spot selling as high as 6c. Antimony is without change, Hallett's being quoted at 15c and Cookson's at 16c. Nickel, 50c to 60c, according to amount and deliveries.

Demand for old metals is brisk and prices are of an advancing tendency. Dealers' selling prices are approximately as follows: Copper wire, 14.75c; copper, heavy, 14.65c; light copper, 13.65c; red brass, 13.75c; red brass borings, 11.75c; tea lead, 14.25c; zinc, 4.60c; pewter, 25c.

LATE NEW YORK NEWS.

(Special Telegram.)

NEW YORK, Nov. 28.—Rail sales of the week include 18,000 tons to the Lehigh Valley; 25,000 additional to the Gould lines; 8,000 to the Duluth, Virginia & Raleigh Lake; enough additional to the Soo lines to make a total tonnage of 19,000; and miscellaneous lots aggregating 20,000 tons. The foreign rail order reported as placed with the Lorain Steel Co. is not confirmed.

The New York Central has ordered from the American Locomotive Co., 300 locomotives, subject to the approval of the executive committee.

Non-union structural steel workers are at work on three large buildings by direction of the Employers' Arbitration board.

Milliken Bros. are filling a $1,000,000 steel order for the national theatre being constructed by the Mexican government.

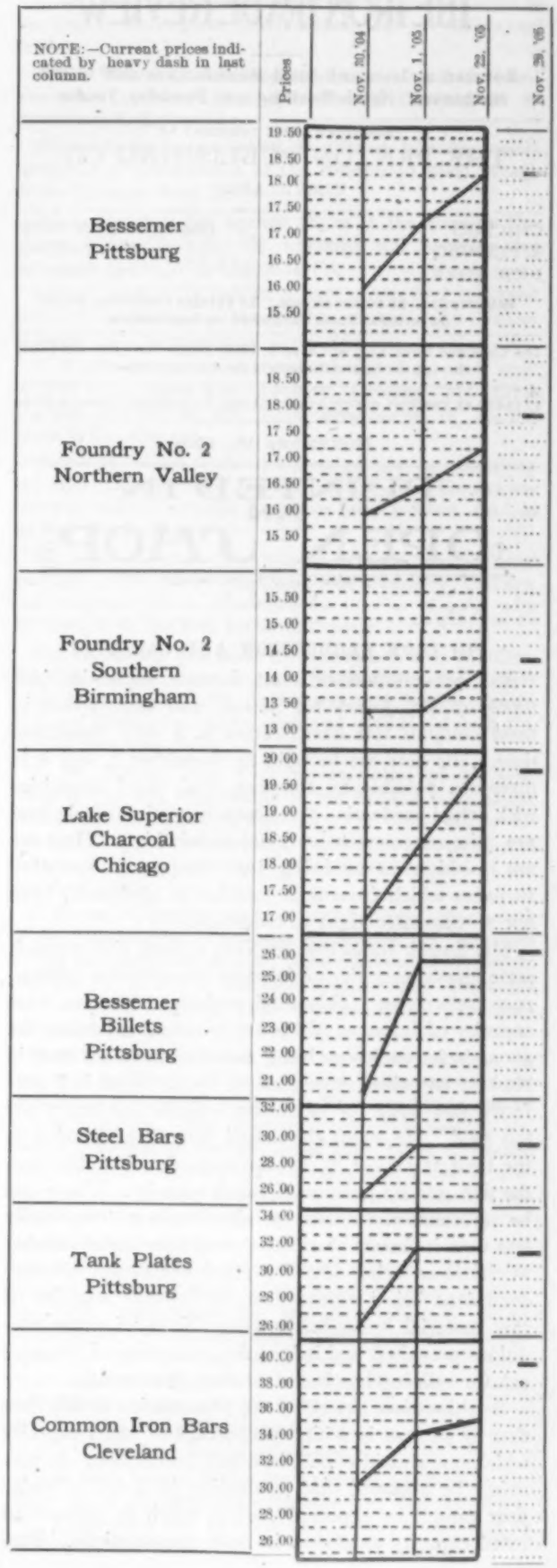
Sales of pig iron since Monday morning have been tremendous, fully one hundred thousand tons having been sold in the Eastern market during the last few days—basic, mill, and foundry grades.

It is reported that new construction at Bethlehem will increase steel making capacity twenty five hundred tons.

The new management of the Republic Iron and Steel Company has decided to dismantle a number of its antiquated plants and concentrate its operations at more favorable locations. Under this policy the rolling mills at Sharon and New Castle, Pa., Brazil, Ind., and the Wabash and Terre Haute mills at Terre Haute, Ind., will be abandoned after the machinery has been disposed of. The plant at Covington, Ky., has also been shut down and, it is reported, will never again be placed in operation.

The American Institute of Mining Engineers announces that its joint meeting with the Iron and Steel Institute will be held in London beginning July 23, 1906, and continuing about two weeks. The Bethlehem meeting is to be held at Lehigh University February 21. Directions for the preparation of papers for both gatherings are contained in a circular just issued by the secretary, 99 John St., New York.

PRICE CHART.



THE IRON TRADE REVIEW

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NOVEMBER 30, 1905

PRINTED IN AN OPEN SHOP

PIG IRON PRODUCTION AND CAPACITY.

The presentation of blast furnace capacities just made by Mr. James M. Swank, and summarized in these columns last week, comes at a very opportune time. His data are brought to November 1, and it is therefore possible to compare total rated capacities with actual production at a time when prices of pig iron are quite remunerative, yet not unduly high. They are not so high as to bring into temporary operation furnaces which from their location or equipment have not a reasonable right to existence.

Mr. Swank states that on Nov. 1, 1905, the approximate annual capacity of furnaces completed is 28,635,000 gross tons. This total excludes 1,500,000 tons capacity of furnaces which are in actual existence, the grounds for exclusion being that they have not been in blast at any time since June 1, 1904. That is a perfectly fair basis for exclusion, neither too harsh nor too mild. He states the actual rate of production at the time as almost 25,000,000 tons, showing that production was 87 percent of rated capacity. There can be no claim made that production was temporarily less than it should be either through an undue number of furnaces being idle for repairs, through weather conditions being unfavorable, or through supplies of raw material being inadequate. None of these conditions prevailed, and indeed the proportion of furnaces out for relining has been less than the normal.

It is therefore shown by the presentation at this time that 87 percent is a high percentage of rated capacity which one should expect in actual production. It may safely be assumed that production in a full calendar year cannot be expected ever to reach 87 percent of rated capacity as shown in such presentations. Production is now substantially at the maximum with the present furnaces, and will be less rather than greater as linings wear out, weather becomes bad and raw materials are more difficult to move.

There are, however, furnaces in process of erection to the extent of 1,830,000 gross tons per year, and expected to be completed before the end of next year. The capacity expected to be completed before June of next year is exactly half of the total, or 915,000 gross tons. Applying the 87 percent rule, we should expect our annual production rate to be increased by about 800,000 tons between now and June 1 next, but as some conditions may not be so favorable it is not likely that we shall for any considerable length of time attain a rate of over say 25,500,000 tons annually. If furnaces not economical to operate in a normal market are blown in, it will probably be because actual production at furnaces now in blast has been curtailed by accident, by bad weather conditions or by insufficient coke movement, which means that the above estimate should be a perfectly safe one until the late spring may set a new pace.

GREAT ADVANTAGES OF LAKE SITES.

The announcement published elsewhere in this issue of Judge Gary, Chairman of the Board of Directors of the United States Steel Corporation, concerning the recent purchase of 2,500 acres on the shore of Lake Michigan, near Hammond, Indiana, makes it practically certain that the Illinois Steel Co. will erect an extensive new plant, and is significant in two respects: it recognizes the tremendous extent to which the western demand for iron, steel and their products has grown and it adds another to the endorsements of the south shores of the great lakes as among the most advantageous sites in the country for manufacturing in this industry.

Railway extensions and improvements have been increasing by leaps and bounds in recent years, until today the demands in this direction form one of the chief items in the iron and steel market, of which Chicago has become a very important center. Chicago mills, however, are at present and have for some time past been unable to turn out railway equipment, especially steel rails, in quantities anywhere near the demand of the section which they naturally should serve. As a consequence the great railroads of the west have been forced into the eastern market, and have been regular customers of Pittsburg. As rails sell at a stated price at the mills throughout the country, they have cost the western lines more by the freight rate from Pittsburg to Chicago than if they had been rolled in or near the latter city.

The decision of the corporation to add to its already extensive holdings in Chicago and vicinity is in pursuance of the policy to build where raw materials can be secured at the lowest possible cost, and in places most accessible to buyers. Southern lake sites ensure a steady supply of ore direct from the corporation's

holdings in the Lake Superior ranges, carried in the corporation's own vessels and landed directly at the plants. It is planned to erect by-product coke ovens in connection with the new works, and the corporation doubtless expects to get its coal at not far distant mines. While the cheapness of the raw material insures low cost of production, another reason for the location near Chicago is found in the fact that the railroad facilities for transporting the finished products from Chicago to western and southwestern parts of the country are excellent, and the congestion which is now so serious in some eastern cities will be avoided. The experiences in some localities at present demonstrate that even after a period in which railway equipment has been largely increased there can be no definite assurance that a shortage will not prevail. The action of the corporation is also a handsome compliment to the officials of the Illinois Steel Co., for their success, particularly in the manufacture of plates and rails, has been a very important factor in encouraging greater operations.

The attitude of the authorities of Indiana and Illinois promises to have an important influence on the corporation's plans. Judge Gary makes this clear, and adds, "The disposition of the Indiana officials seems to be to encourage the location of industries in Indiana in every reasonable way, and therefore, the recent purchases have been decided upon." Nothing is said about Illinois officials, but it is not to be overlooked in this connection that Chicago city authorities recently compelled the Illinois Steel Co. to cease filling up the lake adjacent to its plant, a process which had been going on undisturbed for years, and by so doing made extensions of the plant impossible except at an enormous expense for land. These officials, although possibly actuated by good motives, have shown how it is possible to drive a great industry from a city, or at least prevent its expansion.

Another point which will probably be considered in connection with the location relates to the harbor facilities. The corporation will doubtless be willing to do its share, but it may be necessary for the government to assist in improving the harbor so the large vessels will be able to enter without difficulty. We cannot believe that such co-operation as may be necessary on the part of the government or local authorities will be withheld, and hence, we confidently expect to see, at no distant date, one of the greatest manufacturing plants in the world located on the new site.

Plans of other companies for new construction on the lake front are now well advanced. In addition to the announcement recently made in regard to the erection of blast furnaces at Chicago, Toledo and Cleveland, the new plant to be built near Buffalo, described in another column of this issue, will be an important concern built in accordance with the most progressive ideas.

PERSONALS.

C. H. Bush, master mechanic of the Mexican railroad at the City of Mexico, has been transferred to Chihuahua, Mex.

W. H. Wilson has been appointed superintendent of motive power on the Buffalo, Rochester & Pittsburg R. R. to succeed E. E. Davis.

Peter Isle has suceeeded W. H. Gibson, formerly superintendent of construction at the Homestead Steel Works of the Carnegie Steel Co.

W. J. Chalmers has opened offices in the Railway Exchange Bldg., Chicago. Mr. Chalmers was formerly vice president of the Allis-Chalmers Co.

Aubrey Spencer is making a tour of the iron and steel works in Canada in the interest of the firm of John Spencer & Sons, Ltd., Newcastle-on-Tyne, Eng.

H. F. Stevens has taken charge of the iron and steel sales of C. E. Louis, The Rookery, Chicago. Mr. Stevens was formerly in the sales department of Kelley, Maus & Co., Chicago.

Walter H. Seaver tendered his resignation as secretary and sales manager of the National Steel & Wire Co. and has taken a position with the American Steel & Wire Co. in its New York office.

W. A. Green, who some months ago was made general manager of the Scully Steel and Iron Company, Chicago, has resigned. He is succeeded by Charles Heggie, who has been with the firm for several years.

Nat H. Ashley will sever his connection with Matthew Addy & Co. Dec. 1, to accept a position with the Robert Field Sales Agency. Mr. Ashley was with Rogers, Brown & Co. at Buffalo for twelve years and with Matthew & Co. for the past two years.

E. W. Blandy, New York representative of Mathew, Addy & Co., will take charge of the Eastern sales offices of the Tennessee Coal & Iron Co. The office will be located at No. 5 Broad St. and the territory covered will include the New England, the Middle and several of the Southern states.

T. Frame Thompson has been added to the directorate of the Otis Steel Co., Cleveland, the number of directors having been increased to four. The others are J. T. Smith, chairman; J. E. Touch, managing director; and Frederick Walker, all of London, Eng. George Bartol continues general manager.

Frederick H. Stevens has been elected chairman of the executive committee of the American Locomotive Co., to serve until a successor to the late President Pitkin can be regularly chosen. The committee comprises besides Mr. Stevens, William M. Barnum, Pliny Fisk, Julius E. French and George R. Sheldon. Mr. Stevens was formerly president of the Brooks Locomotive Works before the absorption of that plant by the American Locomotive Co.

J. M. Deetrick has been appointed general superintendent in charge of the northern blast furnaces, Mahoning Valley and Atlantic works, of the Republic Iron & Steel Co., with headquarters in the Brown-Bonnell offices, Youngstown. He has appointed G. F. Hutchins superintendent of the Mahoning Valley works; Robert W. Coates superintendent of blast furnaces in the Shenango Valley and Atlantic works; and P. J. Morgan superintendent of blast furnaces in the Mahoning Valley.

Plans have been prepared for extensive additions to the works of the Westinghouse Machine Co., East Pittsburg, Pa. These plans will be submitted to the stockholders at their next meeting.

SECURITIES SET NEW HIGH LEVELS.

The securities market of the past week was characterized by enormous trading, daily sales averaging near 1,500,000 shares, yet operations were within narrow limits, only a few stocks being dealt in heavily and the majority of securities being neglected and practically without change of importance. As soon as it became certain that relief from the stringent money conditions was at hand with the prospect of permanency, speculators again plunged into the same wild speculation which was the chief factor in producing the tight money and high rates of the last month. Sensational rumors concerning leading stocks were numerous, generally with no other reason or foundation than the desire of manipulation. So wild became the speculation and so apparent the juggling of a number of really meritorous stocks to levels high above those justified by their earning power that several Wall Street banks declined to accept them as collateral at anywhere near present quotations. Trade and market reports continued thoroughly optimistic in tone and outside interests again entered the market, despite the presence of the jugglers, and made possible some profit-taking. Three industrial securities claimed a great deal of attention throughout the week. Tennessee Coal & Iron was the subject of a decided boom, a spurt of several points on Saturday sending it to the highest point of the year. Though a common stock, paying but four percent, it sold eight points higher than Steel preferred paying seven percent. The rise was aided by a vague report that the Steel Corporation was to take over the stock at 150. Republic Iron & Steel went to 101½, the highest point in its history when payment was made on deferred dividends. Westinghouse Air Brake was active and reached the highest figure in two years on reports of big orders and the possibility of its being restored to its former dividend rate of 24 percent annually.

THE LEADING INDUSTRIAL SECURITIES.

	Closing Quotation Nov. 18.	Closing Quo. Nov. 25	Changes	Date of 1905 Ann. Meet.	Par Value	Capital Outstanding	Dividend Basis	Dividend Being Paid	Dividend Date Last Div. Dec.
Allis-Chalmers Co	20⅜	20	− ⅜	Sept.	100	19,820,000			
Allis-Chalmers preferred	62½	62	− ½		100	16,150,000	7 cum		Feb., 1904
American Can	9⅛	9⅜	− ⅛	Feb.	100	41,233,300			
American Can preferred	70½	70½			100	41,233,300	7 cum	5 Q.	Oct., 1905
American Car and Foundry	40¼	39½	− ¾	June 29	100	30,000,000			May, 1905
American Car and Foundry preferred	100¼	100½	+ ¼		100	30,000,000	7 n. c.	7 Q.	Oct., 1904
American Locomotive	67¾	69¼	+1½	Oct. 17	100	25,000,000			
American Locomotive preferred	114	117	+3		100	24,100,000	7 cum	7 Q.	Oct., 1905
American Shipbuilding	55	54⅞	− ⅛	Oct. 4	100	7,600,000	4	4 Q.	Dec., 1905
American Shipbuilding preferred	105	104½	− ½		100	7,900,000	7 n. c.	7 Q.	Oct., 1905
American Steel Foundries	12¼	12	− ½	Oct. 3	100	17,700,000			
American Steel Foundries preferred	46¼	45½	− ¾		100	17,700,000	6 cum		Aug., 1904
Barney & Smith	18	18		June 6	100	1,000,000			June, 1893
Barney & Smith preferred	125	128	+3		100	2,500,000	8 cum	8 Q.	Dec., 1905
Bethlehem Steel	30	30½	+ ½	April 4	100	15,000,000			
Bethlehem Steel preferred	85	89½	+4½		100	15,000,000	7 n. c.	7 Q.	Nov., 1905
Bullock Electric preferred	114	114		Oct. 1	100	1,000,000	6	6 Q.	Oct., 1905
Cambria Steel	27⅞	28½	+ ¾	March 21	50	45,000,000	6	3 S. A.	Aug., 1905
Cambria Iron	49¼	49¼			50	8,468,000	4	4 S. A.	Oct., 1905
Colorado Fuel & Iron	45	45¼	+ ¼	Oct. 16	100	30,132,000	7		Apr., 1902
Wm. Cramp & Sons Ship & Eng. Bldg. Co.	28	25	−3	May 25	100	6,068,000	5		Nov., 1902
Crucible Steel	12¾	13	+ ¼	Oct. 18	100	25,000,000			
Crucible Steel preferred	66	67⅞	+1⅞		100	25,000,000	7 cum		Sept., 903
Empire Steel	7	6	−1	Feb. 22	100	2,281,400			
Empire Steel preferred	38	35	−3		100	2,500,000	6 cum	3 S. A.	Jan., 1901
Fay & Egan	60	90	+30	Feb. 21	100	1,000,000	5	5 Q.	Nov., 1905
Fay & Egan preferred	122½	120	−2½		100	1,000,000	7 cum	7 Q.	Nov., 9055
General Electric	185¼	188	+2½	May 9	100	48,256,050	8	8 Q.	Oct., 1905
International Pump	30	28	−2	June 6	100	12,262,500		2	July, 1905
International Pump preferred	83	82	−1		100	8,850,000	6 cum	6 Q.	Nov., 1905
Lackawanna Steel	81	79½	−1½	March 8	100	34,971,400			
Lake Superior Corporation	17⅛	17⅞	+ ⅜		100	40,000,000			
Niles-Bement-Pond	121	121		Feb. 1	100	5,000,000	6	6 Q.	Sept., 1905
Niles-Bement-Pond preferred	103¾	103¾			100	2,000,000	6 cum	6 Q.	Nov., 1905
Otis Elevator Co	62	62		March 20	100	6,350,300		2 A.	Apr., 1905
Otis Elevator Co. preferred	109	107	−2		100	5,589,500	6 n. c.	6 Q.	Oct., 1905
Pittsburg Coal Co	13⅝	14	+ ⅜	Feb. 11	100	30,135,000			
Pittsburg Coal preferred	52¾	54	+1¼		100	30,716,200	7		Apr., 1905
Pressed Steel Car	50⅝	50½	+ ¾	Feb. 15	100	12,500,000	3	3	Aug., 1904
Pressed Steel Car preferred	98¾	98½	+ ¾		100	12,500,000	7 n. c.	7 Q.	Nov., 1905
Pullman Palace Car	240	252	+12	Oct. 19	100	74,000,000	8	8 Q.	Nov., 1905
Railway Steel Spring	59½	58⅓	−1⅙	March 2	100	13,500,000	7 cum	4 S. A.	Oct., 1905
Railway Steel Spring preferred	102	105⅓	+3⅓		100	13,500,000		7 Q.	Dec., 1905
Republic Iron & Steel	26¾	27½	+1⅜	Oct. 18	100	27,352,000			
Republic Iron & Steel preferred	97½	99⅜	+1⅞		100	20,852,000	7 cum	7 Q.	Jan., 1905
Sloss-Sheffield	84½	87½	+ ¾	March 15	100	7,500,000	5	5	Oct., 1905
Sloss Sheffield preferred	112½	113	+ ⅝		100	6,700,000	7 n. c.	7 Q.	Oct., 1905
Tennessee Coal & Iron	102¼	112	+9¾	May	100	22,552,800		4 Q.	Nov., 1905
U. S. Cast Iron Pipe & Foundry	38⅞	38¼	− ⅝	June 28	100	12,500,000		1	Dec., 1905
U. S. Cast Iron Pipe & Foundry preferred	92⅝	93½	+ ⅞		100	12,500,000	7 n. c.	7	Dec., 1905
U. S. Steel	37¼	38	+ ¾	April 17	100	508,302,500			Dec., 1903
U. S. Steel preferred	103	104¼	+1¼		100	360,281,100	7 cum	7 Q.	Nov., 1905
U. S. Steel 5's	96⅝	96¾	+ ⅛		100	463,798,000	5	5 A.	
Virginia Iron, Coal & Coke	50¾	49¾	−1	Sept. 19	100	8,641,600			
Westinghouse Electric	172	174	+2	June 28	50	20,998,350	10	10 Q.	Oct., 1905
Westinghouse Air Brake	149	157⅞	+8⅞	Oct. 3	50	10,990,450	20	20 Q.	Oct., 1905

An increase in the stock of the South Baltimore Steel Car & Foundry Co. from $750,000 to $1,250,000 has been approved by the stockholders.

Directors of the Republic Iron & Steel Co. have declared the regular quarterly preferred dividend of 1¾ percent and in addition a dividend of 1⅜ percent on the deferred dividends which amounted to 13⅜ percent. Both are payable Jan. 2. Further back dividends will be paid from time to time out of the earnings.

Shareholders of the General Electric Co. will be permitted to subscribe at par to the extent of 12½percent of the holdings for $6,033,000 new stock. Stockholders meet Dec. 5 to consider an increase in capitalization from $48,325,500 to $60,000,000, which President Coffin says is necessary to carry on the business, which is 40 percent heavier than last year. Only a part of the increase will be issued at once.

GREAT DEVELOPMENTS ALONG THE LAKES.

UNITED STATES STEEL CORPORATION WILL BUILD ON SHORE OF LAKE MICHIGAN.

New York Steel Co. Will Erect a Large Plant Near Buffalo—Garrett-Cromwell Engineering Co. Awards Contracts.

Owing to the delay in the transmission of the telegram from New York telling of the purchase by the United States Steel Corporation of a tract of land near Chicago, on which will be built a large steel plant, we were unable to make any announcement of same in last week's issue.

This land, of which 2,500 acres are included in the purchase, is located on the lake shore in Indiana, east of Tolleston, about five miles from Indiana Harbor and twelve miles from South Chicago. The mouth of the Grand Calumet River adjoins the company's property, the course of this stream flowing to the northwest through it. It is the Corporation's intention to commence at once the work of improving the new land, which will include dredging the harbor and river mouth, the building of piers and the leveling of the sand dunes on the lake front. It will be some months before actual construction work on the building can be commenced.

The need for this plant has been evident to local officials for some years, and President Buffington, of the Illinois Steel Company, has persistently urged its construction. It was only last year, however, that he succeeded in prevailing upon the executive committee of the Corporation to acquiesce in his wishes and make the desired appropriation. The rail mill at South Chicago has long been inadequate to the demands upon it, and the company could have sold its output twice over almost any time in the last few years. It is taken as a foregone conclusion that the new plant will include a rail mill of larger capacity than the mill at South Chicago. This will involve the construction of blast furnaces, Bessemer converters and the other departments necessary to the manufacture of standard sections. The new plant will doubtless also provide for the necessary increase in open hearth capacity, it having become evident that the present plant at South Chicago, despite the fourteen new furnaces, built and building, is inadequate to the demands made upon it. A merchant bar mill is also talked of, for which the need is urgent, the Milwaukee plant being utterly unable to cope with the present volume of business. The site is admirably suited for a steel plant, railroad connections being afforded by the Baltimore & Ohio, Pennsylvania, Lake Shore, Wabash, Pere Marquette and other lines. It is also reached by the belt railways of Chicago, giving it access to the railroads traveling in westerly directions.

George G. Thorpe, formerly manager of the Clairton plant of the United States Steel Corporation, who has just been made second vice president of the Illinois Steel Company, will, it is expected, have entire charge of the construction of the new plant.

In response to repeated inquiries recently made E. H. Gary, chairman of the Board of Directors of the United States Steel Corporation, gave out the following statement November 22:

"A large body of land approximating 2500 acres, located on the shore of Lake Michigan in the State of Indiana, has recently been acquired in the interest of the United States Steel Corporation or its subsidiary companies. The Illinois Steel Company will probably in the near future make important improvements on this property for manufacturing purposes. The extent of the improvements will depend upon the attitude of the public authorities in Indiana and Illinois respectively. Formerly the concentration of plants of this company has been carried out at its location at South Chicago. During the past ten years its works, known as North Works and Bridgeport Works, located within the city limits of Chicago, have been partially removed to the South Chicago location. This location is well adapted to its business in many ways, and the works there would be further developed if there were sufficient room at that point. The disposition of the Indiana officials seems to be to encourage the location of industries in Indiana in every reasonable way, and therefore the recent purchases have been decided upon. In any event there will probably be erected on this site blast furnaces, open hearth furnaces, by-product coke ovens and various mills for the manufacture of a diversity of steel products."

Plant of the New York State Steel Co.

Still further evidence of the increasing tendency to select sites along the great lakes as the best possible locations for iron and steel plants is furnished by the action of the New York State Steel Co. in deciding to build a plant on the Buffalo river. The plans of this company, whose offices are at Buffalo, have proven to be more extensive than appeared from the first announcement some few weeks ago.

The Garrett-Cromwell Engineering Co., of Cleveland as engineer for the new company has been letting contracts during the past week for the first part of the installation, which consists largely of an open-hearth steel plant of the continuous or Talbot type; blooming and billet mill, with their necessary railroad tracks, yard equipment, etc.

The company has purchased some 75 acres of land on the Buffalo river adjacent to the Lake Shore Railroad, on which property the plant will be located. This location has been selected with a view of having the Buffalo river made navigable to that point in order to provide for the delivery of ore by lake vessels direct to the blast furnaces.

The plans of the Company contemplate two 400-ton blast-furnaces, and the increase of the steel plant from 500-tons to 1000 tons per day, also a finishing department which will be in the direction of structural material and wire products.

During the past week a number of contracts have been placed for machinery and equipment. The following are some of the successful bidders: United Engineering & Foundry Co., Pittsburg, 36-inch blooming mill; Mackintosh, Hemphill & Co., Pittsburg, blooming mill engines and bloom shear; Stirling Consolidated Boiler Co., Pittsburg, 4,000 h. p. water tube boilers; Wilson-Snyder Co., Pittsburg, hydraulic pressure and feed pumps; Westinghouse Electric & Mfg. Co., Pittsburg, three 250 k. w. generators; Green Engineering Co., Chicago, chain grate stokers; Platt Iron Works Co., Dayton, O., feed water heaters; C. W. Hunt Co., New York, coal and ash handling machinery; Alliance Machine Co.,

Alliance, O., ingot stripping and traveling crane equipment.

Some of the prominent stock-holders and directors of the new company are Spencer Kellogg Sr., S. R. Mann, S. M. Clement, John D. Larkin, H. J. Pierce, Whitney G. Case, Wm. M. Evarts, E. P. Wilson and Chas. Cooke, all of Buffalo, N. Y. Mr. Spencer Kellogg Sr., is President, and Stewart R. Mann is Secretary and Treasurer.

Ground has been broken and the engineers expect to have the first part of the plant completed and in operation not later than Oct. 1, 1906.

New Shipbuilding Concern.

The Toledo Shipbuilding Co. has been incorporated under the laws of Maine with a capitalization of $1,100,000, and has purchased the plant of the Craig Shipbuilding Co. at Toledo, O. The new company will take charge in the near future with the following officers: A. McVittie, Detroit, president; L. C. Smith, Syracuse, vice president and treasurer; H. S. Wilkinson, Syracuse, secretary; C. B. Calder, Detroit, general manager and Frank E. Kirby, Detroit, consulting engineer. Messrs. McVittie, Calder and Kirby have been connected in corresponding positions with the American Shipbuilding Co., and Messrs. Smith and Wilkinson are large vessel owners of Syracuse, being heavy stockholders in the United States Transportation Co., operating a large fleet of steel steamers. The new company will complete the work now under way in the Craig yard and will considerably increase the capacity of the plant, adding another dry dock 650 feet long, large enough to accommodate any vessel on the lakes. There are now two berths for new ships and a dry dock 525 feet over all.

Another Steel Freighter.

Pickands, Mather & Co., Cleveland, have placed an order with the American Shipbuilding Co. for a steel freighter to be 550 ft. over all, 530 ft. keel, and 60 ft. beam. The new boat will have a carrying capacity of 11,000 tons and will come out next July. She will be the second lake steamer with a beam of 60 ft. the W. G. Mather, now building at the yard of the Great Lakes Engineering Co., being of that width, but 19 ft. shorter than the one just ordered. It will cost upwards of $400,000.

Furnace Improvements.—Furnace No. 2 of the Ashland Iron & Mining Co., Ashland, Ky., was blown out Nov. 11 for extensive repairs to the stack, relining, and the enlarging or rebuilding of three hot-blast stoves. Propositions on the work are solicited. No. 2 furnace had been in blast four years, nine months and 20 days, running exclusively on high-silicon and Bessemer-ferro silicon. No. 1 furnace, running on the same product, was lit Nov. 14.

The Republic Iron & Steel Co. is now established in its new offices on the 8th floor of the Trinity Building, No. 111 Broadway, New York. The suite of rooms is occupied by the executive offices and the Eastern sales department, the latter to remain under the management of E. W. Parker. The general business offices are still in Chicago.

The Seneca Wire & Mfg. Co., recently incorporated in Ohio for $100,000, has purchased the wire nail plant and patents of the Henry Co., Cuyahoga Falls, O., and will move it to Fostoria, where new buildings are being erected. Roofing, wire nails and other wire specialties will be manufactured.

OBITUARY.

William L. Kier, president of the Kier Fire Brick Co., died Nov. 26 at his residence in Pittsburg after a brief attack of pneumonia.

David June, founder and head of the firm of June & Co., engine manufacturers at Fremont, O., died Nov. 21 at the age of eighty-one.

William H. Edgar, founder and president of the Dearborn Drug and Chemical Company, Chicago, died Sunday, November 26th, in Hot Springs, Ark., after an illness of several weeks.

James B. Oliver, president of the Oliver Iron & Steel Co., Pittsburg, died Nov. 28 after a brief attack of pneumonia. Mr. Oliver, who was 61 years of age, had been a prominent figure in iron and steel circles for many years.

Col. Francis Wister, a prominent figure in social and club life of Philadelphia, died Nov. 22 after a brief illness. He was an iron and coal broker in that city for a number of years after his return from the Civil war.

William Parkinson died Nov. 20 at Orange, N. J. He was engaged for a time as mechanical engineer for Thomas A. Edison, whom he left to go with the New York Steam Engine Co., and later with the Atlas Steam Engine Co., Indianapolis. He was also for many years a partner of Henry W. Bulkley in the Newark Iron Works and was president of the Watchung Coal Co.

Minor I. Wilcox, of Toledo, for many years prominent in marine and manufacturing circles of that city, died Nov. 19. He was founder and president of the M. I. Wilcox Cordage & Supply Co., headed the firm of Wilcox, Stock & Co., manufacturers of steam dredges and shovels, was president of the Maumee River Steamboat Co., vice president of the Vulcan Iron Works, and a director in the Milburn Wagon Co.

Joseph R. Laughrey, one of the best known coal and coke operators of western Pennsylvania, died Nov. 23 at his home in Dawson, Pa., a few hours after the marriage of his daughter. He entered the mines of Brown & Cochran at an early age and rose until he became general manager of their properties. He helped organize the Washington Coal & Coke Co., serving for several years as director and treasurer. He was also an organizer and official of the Washington Run Railway Co., and a stockholder in the Dawson Supply Co. and the Cochran Coal & Coke Co., besides being interested in banking. He was sixty years of age.

American Agency Established.—Stephens & Co., owning and operating the Dinas Silica Works at Kidwelly, South Wales, are soon to establish American agencies for their products which include brick, cement, moulders' silica paint, foundry blacking, sand and other furnace supplies which have enjoyed a world-wide trade. A corps of experimenters is kept constantly at work improving furnace and foundry preparations. The British war office, admiralty, India office and many foreign governments are regular customers.

Tool Steel Department.—The Bourne-Fuller Co., Cleveland, O., announces that owing to the increased volume of its tool steel trade, it finds it necessary to establish a tool steel department. J. C. Scott, to whose skill and efforts the growth of that branch of the business is largely due, will have charge of the new department. Associated with him will be a corps of experienced tool steel salesmen. To properly supplement its mill deliveries, this company will carry in stock a full assortment of all grades.

SATISFACTORY RESULTS

At Most of the Plants Doing Much for the Government.—Report of Chief of Ordnance.

(Special Correspondence.)

WASHINGTON, Nov. 28.—Iron and steel interests are referred to extensively in the forthcoming annual report of the Chief of Ordnance of the War Department. The report says in part:

Guns and Carriages.

No funds were appropriated at the last session of congress for new installations of seacoast guns in this country. The carriages for installation in the insular possessions for which appropriations were made are under construction.

In addition to carriages being made at arsenals, contracts exist with the following private manufacturers, viz: 15-pounder R. F. guns and carriages, with the Bethlehem Steel Co.; 4.5-inch shields for 5 and 6 inch barbette carriages, with the Midvale Steel Co. and the Bethlehem Steel Co.; 5-inch barbette carriages, model of 1903, with the Morgan Engineering Co., 6-inch disappearing carriages, L. F., models of 1903 and 1905, with the Wellman-Seaver-Morgan Co., the Bethlehem Steel Co., and the Detrick & Harvey Machine Co.

Streaked Forgings.

The matter of streaks in steel forgings for guns continues to be a subject of investigation. These streaks, as has been reported, are believed to indicate either a want of continuity or a lack of perfect structural homogeneity in the metal; more probably and certainly much more frequently, the latter. The investigations already made have developed to a certain extent what streaks are, but have thrown very little light on the question of their source. It seems probable that any structural unsoundness must have its origin during the period of casting or of cooling the ingot. The most promising field of inquiry seems to be, therefore, the ingot itself, for the operations of forging tend to obscure or even obliterate the condition in the ingot which is developed into the streak in the finished gun forging. Investigation along these lines must, of course, take very considerable time and be expensive, but the possibility that the information gained might lead to a discovery of the means of improving structural conditions would, it is thought, justify the expenditure of the necessary time and money.

During the year the Bethlehem Steel Co. was engaged in the supply of material to this department under 20 contracts, 9 of which were completed, and also under orders for miscellaneous bars, forgings, and castings from commanding officers of arsenals and other contractors. The principal material inspected by this office during the year included guns, cannon, carriages, shields, gun forgings, projectiles, and field artillery material.

Ohio and Pennsylvania Companies.

The inspection work at Akron, Ohio, Alliance, Ohio, Cleveland, Ohio, Sharon, Pa., Pittsburg, Pa., and contiguous localities, for the year has been in charge of Capt. J. H. Rice, Ordnance Department, U. S. Army, with main office at Akron, Ohio.

The Wellman-Seaver-Morgan Co., Akron and Cleveland.—This company is manufacturing twenty-five 6-inch disappearing carriages, L. F., model of 1903; 3 were delivered during the year, 3 will probably be delivered during the month of July, 1905, and the final delivery will probably be about July 1, 1906. The contract calls for final delivery on August 19, 1905.

The Morgan Engineering Co., Alliance, Ohio.—Beginning with the fiscal year this company had contracts for fifteen 6-inch disappearing carriages, L. F., model of 1903, and ten 5-inch barbette carriages, model of 1903. One 6-inch carriage was delivered prior to the beginning of the fiscal year, and the last of the remaining 14 on April 18, 1905. The final delivery of the 5-inch carriages was due Jan. 10, 1905; the first carriage was delivered on May 29, 1905; the remainder are about 90 percent completed, and final delivery will probably be about Sept. 15, 1905. The delay has been principally caused by difficulty in obtaining acceptable steel castings. The work done by this company has been satisfactory.

The Warner & Swasey Co., Cleveland.—During the year this company had contracts for 271 3-inch telescopic sights, model of 1904; 20 battery commander's telescopes; 42 Swasey depression position finders, type A; 117 Swasey depression position finders, type A—1; 1 25-foot horizontal base range finder; 1 8-foot horizontal base range finder; 6 sets of testing instruments for Swasey depression position finder, and 1 6-foot horizontal base finder and protected battery commander's telescope, for mobile artillery. Twenty depression position finders were delivered prior to July 1, 1904. The following instruments have been delivered during the year and on time, except for delay caused by changes in the drawings: 236 sights, 1 battery commander's telescope, 54 depression position finders, 1 6-foot range finder and protected battery commander's telescope. The remaining 35 sights will be delivered by July 15, 1905. The remaining battery commander's telescope will probably be delivered September 12, 1905, and the remaining 85 position finders by October 1, 1905. The horizontal base range finders are awaiting the result of experiments. The testing instruments will probably be delivered September 17, 1905. The work done by this company is considered satisfactory.

The Driggs-Seabury Ordnance Corporation, Sharon, Pa.—The contracts on hand with this company during the year were for 116,000 one-pounder large capacity steel shell, one experimental 6-pounder gun and mount, 368 3-inch field limbers, model of 1902, and 234 3-inch field caissons, model of 1902. The 6-pounder mount and gun are being delayed by lack of steel castings and the date of delivery can not be safely predicted. No deliveries have been made on the 3-inch field caissons and limbers, the date of final deliveries for which are as follows: Limbers, October 14, 1906; 164 caissons, August 6, 1906, and 70 caissons, January 1, 1907.

The Crucible Steel Co. of America, Pittsburg, Pa.—During the year this company has had contracts for 98 sets of shields for 3-inch field carriage, model of 1902, and 296 sets of shields for 3-inch field caisson, model of 1902, including chest door. Three sets of caisson shields were delivered prior to July 1, 1904, and the remainder were all delivered during the fiscal year and on time. The work done was satisfactory. This company had at the beginning of the year a contract for 1,656 6-inch and 936 5-inch A. P. shot. The contract was completed and the deliveries were made during the year.

The work of the inspecting officer at the Midvale Steel Works includes not only the inspection of material manufactured at these works, but also that manufactured by 15 other contractors in Philadelphia and vicinity.

During the year the Midvale Steel Works prosecuted work under 32 contracts with the department and ordnance establishments, and under 12 contracts as subcontractors. Of these, 36 contracts have been completed during the year.

The work at outside manufacturers comprised 100 contracts at 15 establishments. Of these, 74 have been completed.

The principal material inspected during the year in-

cluded 414 forgings, 13 shields for gun carriages, 7,388 steel forgings for gun carriages, 327,875 pounds of steel for small arms, about 100,000 pounds of tire steel, about 10,000 pieces of flange steel, 647 steel castings, 8,386 bronze castings, 403 iron castings, 1,398 steel springs, and 2,000 medals of honor.

Maryland and Other Companies.

Detrick & Harvey Machine Co.—The last of fifteen 6-in. disappearing gun carriages, L. F., model of 1903, under contract dated August 19, 1903, was delivered on March 25, 1905. Almost all the component parts of these fifteen carriages were done by jig, and, in addition, all circular parts were ground so that the resulting carriages are believed to be exceptionally well made. On February 6, 1905, a second contract was made with this company for furnishing ten carriages of the same design. All gun and common iron castings have been delivered and the smaller parts finished. Forty-three heats were required for the production of the castings required. One hundred and eighty-five test specimens were pulled, each heat averaging 31,699 pounds per square inch. Of the parts cast, three racers, two base rings, four top carriages, and many minor parts were rejected due to faulty material. The forgings and about seven-eighths of the steel castings have been received, but many of the latter parts have been returned to the makers on account of defects in the material. Of the larger parts, eight racers and five base rings are machined.

Ellicott Machine Co.—On Jan. 25, 1905, a contract was made with this company for 500 cast-iron caps for 5-inch projectiles, and on April 15, 1905, another contract was made for 1,000 cast-iron caps for 8, 10, and 12 inch projectiles. The caps under the above contracts are being made by the American and British Mfg. Co., of Bridgeport, Conn., as subcontractor.

Of the 8,000 of 15-pounder steel-shell ammunition remaining to be delivered by the United States Rapid-Fire Gun and Power Co. at the beginning of the fiscal year, one lot of 1,000 rounds has been delivered. Several other lots presented failed in the ballistic test, and the probability of the company's being able to supply the remaining rounds seems extremely small. During the year this company completed the conversion of the 20 3-inch wrought-iron muzzle-loading guns to breech-loading saluting guns, contracted for the preceding year, and an additional order for 25 more guns of the same type. They have also under manufacture and practically completed one 6-pounder semi-automatic gun and mount.

During the year the American and British Mfg. Co have done work under 15 contracts with the Department, and two orders from ordnance establishments. These contracts and orders covered the following material, viz, 34 3-inch field guns, model of 1902; the conversion of 135 3-inch wrought-iron muzzle-loading guns to breech-loading saluting guns; 40 3-inch field carriages, model of 1902; projectiles for small cannou, and hubs for wheels of field gun carriages. With the exception of 15-pounder steel shell, all deliveries have been satisfactory. A number of lots of these shell failed in the ballistic test, but the company appear now to have overcome this difficulty and it is expected will speedily complete the deliveries under this contract. In addition to the contracts and orders mentioned, they have also made 778 hubs for wheels for field carriages for the Archibald Wheel Company, and have just received a contract for 70 3-inch field caissons, model of 1902, and 20 more 3-inch field carriages.

The Scovill Manufacturing Co. received a contract in February for 25,000 1-pounder steel shell, to be delivered in September, 1905. The work is progressing favorably, and no delay in delivery is anticipated.

The work of the Builders Iron Foundry, Providence, R. I. was inspected during the year by Lieut. Walter G. Penfield, Ordnance Department. The 12 carriages referred to in my last report as remaining uncompleted were shipped during the year, and the contract was completed on May 2, 1905.

The Archibald Wheel Co., Lawrence, Mass. is engaged in the manufacture of wheels for mobile artillery. During the present fiscal year 878 wheels were completed and inspected. Maj. Frank Baker, Ordnance Department, was the inspector at these works until May 1, 1905, upon which date he was relieved by Lieut. Walter G. Penfield, Ordnance Department.

The Cowdrey Machine Works, Fitchburg, Mass. has been engaged during the present fiscal year in manufacturing cast-iron projectiles under three different contracts with this Department.

METAL TRADES ASSOCIATION NOTES.

Robert Wuest, Secretary of the N. M. T. A. and editor of "The Open Shop" has in addition to his other duties, been appointed Acting Commissioner of the Association, W. P. Eagan, the commissioner having been granted a vacation of considerable length for the benefit of his health.

J. H. Cone, who on October 25th, was appointed Assistant Secretary of the National Metal Trades Association, has successfully concluded the merging of the Boston Metal Trades Association by unanimous resolution, with the National Metal Trades Association. This is the second association in which Mr. Cone was successful in bringing about a merger, the other being that of the Buffalo Metal Trades Association. This brings the total number of local associations which have become branches of the national up to five, they being as follows:—Chicago, St. Louis, Cincinnati, Buffalo and Boston. Mr. Cone is to be congratulated on this splendid showing, since the numerical strength of the Association has been increased in proportion to a larger degree by the merger of the of the Buffalo and Boston associations than by the others.

The Administrative Council of the National Metal Trades Association, at its recent semi-annual meeting in Cincinnati, fixed March 21st & 22nd, 1906, as the date, and Cleveland, O., as the place for holding the next annual convention.

The secretary of the Cleveland Manufacturers Association is desirous of bringing about the merger of that association with the National Metal Trades Association.

May Acquire Ohio Valley Plants.—Negotiations are under way, it is reported with success, that Charles M. Schwab is to acquire four Ohio Valley plants, the Kelly Nail & Iron Co. and the Belfont Iron Works of Ironton, O., and the Norton Iron Works and the Ashland Steel Co. of Ashland, Ky. The four plants which are owned by interests closely connected, have an aggregate capitalization of about $2,200,000. The deal is being engineered by Rogers, Brown & Co. of Cincinnati. It is understood that a proposition for the purchase has been made to Mr. Schwab who has inspected the properties. Three blast furnaces, three nail mills and three wire mills are operated by the three plants first mentioned; The Ashland Steel Co. manufactures wire rods and billets.

The Grand Rapids Malleable Iron Co. has sold its plant in Grand Rapids, Mich., to the Chicago Railway Equipment Co., Chicago.

Novel Water Hoist Adapted to Coal Mining.

The question of unwatering a mine always is a serious problem to the mine management, especially so when the water is highly impregnated with acids. When the amount becomes excessive the means to be employed for disposing of it taxes the ingenuity of all concerned to the uttermost.

In the anthracite regions there are mines in which for every ton of coal raised, as high as 14 tons of water must be pumped, and the latter must be done at a minimum of expense. Nowhere, probably, have a greater variety of pumps and lifting devices been tried—and the most satisfactory type, up to date, for handling large quantities of water at comparatively low heads, have proved to be large bailers operated by steam engines. These, however, lack the mechanical regularity inherent in a pump, as they are necessarily operated by men, and it remained for The Delaware, Lackawanna & Western R. R. Co. and its electrical engineer, H. M. Warren, to finally develop a water-hoisting equipment which would preserve all the valuable points of the steam hoist and at the same time operate automatically. The carrying out of the mechanical details of the hoist and its automatic devices were confided to The Wellman-Seaver-Morgan Co., of Cleveland, O., which guaranteed the machinery to accomplish the desired results. Most of the electrical controlling devices were furnished by the Electric Controller & Supply Co., Cleveland, O. In the original specifications the D. L. & W. R. R. Co., called for the hoist to be operated by an alternating current motor of 800 h. p. and the question of starting, stopping and reversing so large a motor had, at the outset, to be met. The duty to be performed by the hoist, called for the raising of 4000 gals. of water per minute to a height of 550 feet.

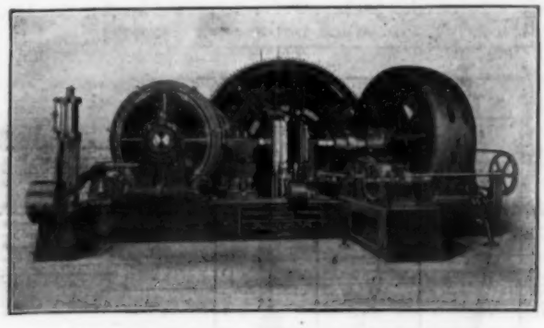


FIG. 1. SIDE VIEW OF DRUM AND MOTOR.

FIG. 3. VIEW OF HEAD FRAME.

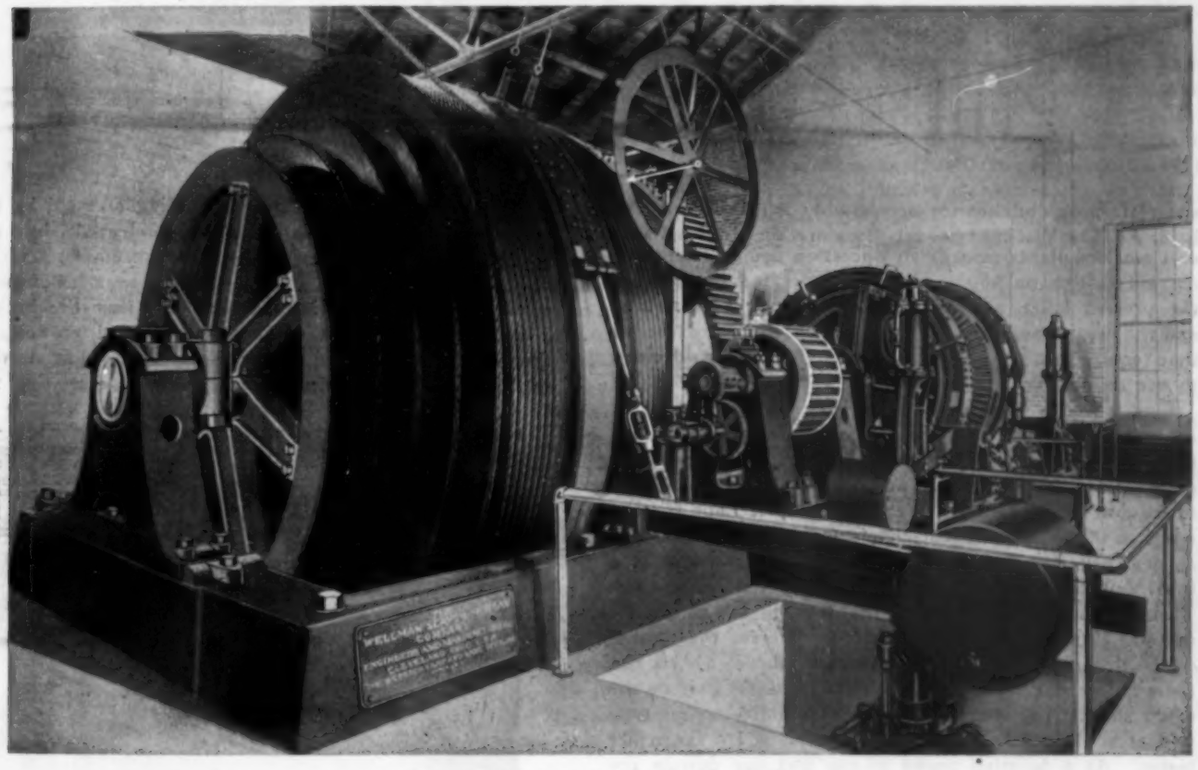


FIG. 2. FRONT VIEW OF DRUM AND MOTOR.

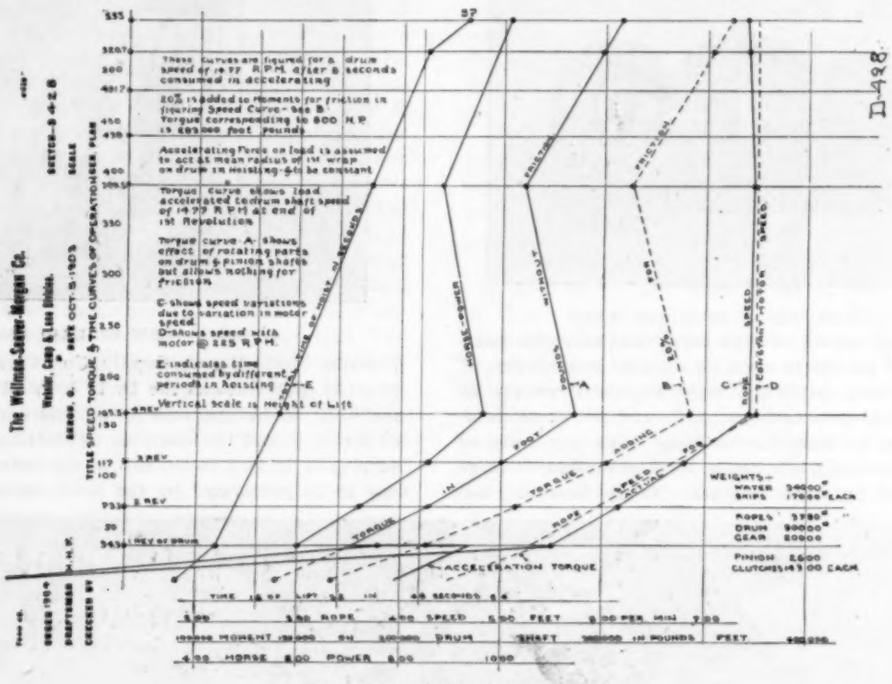
To raise the water buckets and rope required an expenditure of 610 net horse power.

The weight of the bucket equaled half the weight of the water, so that the weight on rope was 53,235 lb. or nearly 27 tons, requiring 2-inch steel rope. The various preliminary speed and movement diagrams are laid out as per accompanying diagram.

It was decided in carrying out the design that it would be impracticable to design the hoist other than have a motor running continuously in one direction, as it is a well-known fact that the amount of current required to accelerate a large motor of this type is enormous, and greatly interferes with the proper running of the power plant.

The D. L. & W. R. R. Co., desired to use an alternating current motor directly at the hoist, and as the motor was to run continuously in one direction, this necessitated the use of friction clutches for accelerating and reversing the load. As The Wellman-Seaver-Morgan Company had several smaller plants already in operation using alternating current motors on hoists which are operated similarly to the present hoist, and as they are running successfully, and the repairs and renewals for clutches had not exceeded that required for the other hoisting engines, it was decided to use this method.

Figs. 1 and 2 show a front and side view of the hoist. As will be noticed, the general arrangement consists of a motor driving a pair of bevel wheels through a single bevel pinion. The bevel wheels run loose on a shaft and are fitted with the well known Webster, Camp & Lane friction clutches. The operating mechanisms for the clutches are so designed that only one clutch can be thrown in at a time, but both clutches can be out at the same time. Throwing in one clutch causes the drum to run in one direction; throwing in the other clutch reverses the motion of the drum. To the shaft on which the bevel wheels run there is keyed a pinion meshing with the main gear on the drum shaft. The drums are of the cylindro-conical type 10 feet at the small diameter and 16 feet at the large diameter. At a hoisting speed of 550 feet per minute the drum makes about 15 revolutions per minute. There is one main brake located between the drums. All of the clutches and brakes are operated by auxiliary air cylinders fitted with oil cushion cylinders, the compressed air being furnished by a motor driven air compressor and the necessary tanks located near to the hoist. The hoist is controlled by a mechanical device shown in Fig. 2. This device consists mainly of a drum rotated by means of a friction drive from the motor through a sprocket chain. The drum shaft transmits its motion to a secondary shaft fitted with variable speed which in turn operates a secondary stop. The main hoisting drum shaft operates a traveling nut which is so located with respect to the controller drum that at either end of its travel it releases a stop and allows the controller drum to make a quarter turn; this movement, through suitable electrical connections, operates the solenoids on the clutch valve, releasing the clutch and the solenoid on the brake valve setting the brake, the further



SPEED AND MOVEMENT DIAGRAM.

movement of the controlling drum being arrested by the secondary stop. This stop is released by the variable speed shaft and its connections, which has been given a predetermined time movement corresponding to the interval for emptying the bucket. The further movement of the controlling drum releases the brake and throws in the reversing clutch, thus starting the hoist in the opposite direction, and also starting the

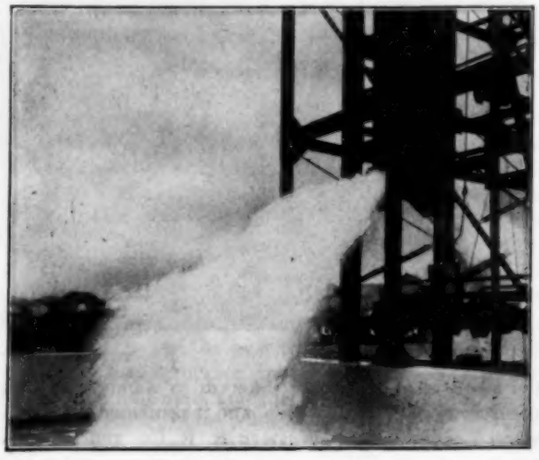


FIG. 4.—BUCKET DISCHARGING.

traveling nut on the controlling mechanism in the opposite direction. At the end of the hoist the cycle of controlling

movements is repeated and so on, making the hoisting operation continuous and automatic. Every attention has been given to the safe operation of the hoist. The main brake is of the gravity type and to be released the current must be on the solenoid operating the valve so that air can be admitted to the underside of the brake piston.

If for any reason, either the supply of current or of air pressure is interrupted, the valve drops, and the weights on brake lever set the brake. The clutches are designed so that they are thrown out by weights. As is the case with the brake, either clutch can only be thrown in when the current is on the solenoid, and the air pressure admitted under the piston, and if either current or pressure fail, the clutch is off. The motor shaft is fitted with an emergency brake operated by a weight controlled by a solenoid—any interruption in the flow of current to the motor sets the brake and stops the motor. Any interruption of the flow of the current stops the machine, throws out the clutches and puts on the brake. A safety cut-out is provided for in the head frame so that in case a bucket is carried beyond the proper height, the current is cut off.

Fig. 3 shows the head frame. The head frame is 93 feet from the base to the center of the sheave at the top. It is built of structural steel, roughly in the shape of an "A". From the head frame are suspended two buckets 6 feet in diameter and 19 feet 6 inches deep. The capacity of each bucket is 17 tons of water. In the bottom of the bucket are located two lift gates with an area practically equal to the cross section of the bucket. These gates are lifted automatically when the bucket reaches the top, and the water is discharged through the bottom into a spout fitted below the bucket, and which deflects it to either side of the shaft. Each bucket makes a complete round trip in one minute and fifty seconds, the total lift being 555 feet.

Fig. 4 shows a nearer view of the bucket when discharging.

TIPS FROM CONSULAR AGENTS.

Although Argentina now purchases nearly 70 percent of its agricultural machinery, approximately $2,500,000 worth annually, from the United States, Consular Agent Hutchinson warns our manufacturers that there is danger of losing a considerable part of the trade unless machines are made more heavy and less liable to break, and are confined more closely to standard designs for which repairs can easily be secured. Our banking and shipping facilities are also in need of improvement to aid the American exporter.

American sewing machines enjoy a practical monopoly of the Chinese trade, writes Agent Burrill, because of the progressive methods employed by one of our leading manufacturers in invading and developing that field.

Canada's railroad building now under way or to be completed within the next five years includes almost 7,500 miles with an estimated cost of $182,000,000.

During the fiscal year ending June 30, Canada imported 250,000 boxes of tin plate valued at $2,878,000. About one fourth came from the United States. Great Britain furnished less than in former years although her total exports in that line were near 400,000 tons.

Knobbled Charcoal Iron.—The Dover Forge & Iron Co., Canal Dover, O., is producing interesting results in the revival of the knobbled charcoal iron industry. During October this company produced 510 tons of blooms on six knobbling fires. This tonnage is said to be double that claimed by old eastern forges. All of the material was manufactured into boiler tubes for locomotives and successfully passed the master mechanics' tests.

PROGRAMME OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

Since the publication of the notice of the Fifty-Second Meeting of the American Society of Mechanical Engineers, in our issue of November 16th, a complete programme has come to hand.

As before mentioned the headquarters will be at 44 W. 27th St., and the opening session will be on Tuesday evening, December 5th, at which time President John R. Freeman will deliver his annual address. Following this the meeting will be devoted to a social reunion.

Wednesday morning will be devoted to the second session, the meeting opening at 10:00 o'clock on board the steamship "Americka". An address of welcome by Mr. E. Boas, Gen. Mgr. of the Hamburg-American Line, will be followed by the annual business meeting of the society. This meeting with the session on Friday morning will be the only ones at which new or general business may be presented. At the conclusion of the routine business the first professional paper of the meeting will be presented by J. M. Whitham, "Use of Natural Gas Under Boilers." The vessel will be inspected after adjournment, which will be to Wednesday evening at 8:30.

Wednesday afternoon an excursion will be made to the New Henry R. Worthington Hydraulic Works at Harrison, N. J. A special train will leave the D., L. & W. R. R. station at Hoboken Ferry at 12.45 o'clock, returning at 4.45 o'clock.

Wednesday evening an excursion will be made to the lecture by Prof. R. W. Wood of Johns Hopkins University on the "Photography of Invisible Phenomena." At its close a reception will be held, making the evening's lecture, to which the ladies are especially invited, something of a social affair.

The third session will begin Thursday morning at headquarters, and "Bearings" will be the principal subject of discussion; to be followed by various other short papers and topical talks. The meeting will be concluded with a paper by E. N. Hunting, "Re-inforced Concrete Applied to Modern Shop Construction."

Luncheon will be served immediately after the close of this session.

On Thursday afternoou the New York School of Automobile Engineers will be visited.

Thursday evening will be devoted to a reception and conversazione at Sherry's, after which there will be dancing, for which cards of admission will be required.

The closing session on Friday morning will be devoted to the following professional papers:

"Measurement of Air Flowing through Circular Orifices in Thin Plates" by R. J. Durley; "Results of Preliminary Producer Gas Tests. U. S. Geological Survey Testing Plant. St. Louis, Mo." by R. H. Fernald; "Pressure Drop through Poppet Valves" by Charles E. Lucke; "Test of Elevator Plant. Trinity Bldg, New York City" by A. J. Herschmann; "The Realization of Ideals in Industrial Engineering" by H. F. J. Porter. Concluding Business. Adjournment.

Chattanooga, Tenn. has been fixed as the place for the Spring Meeting of 1906.

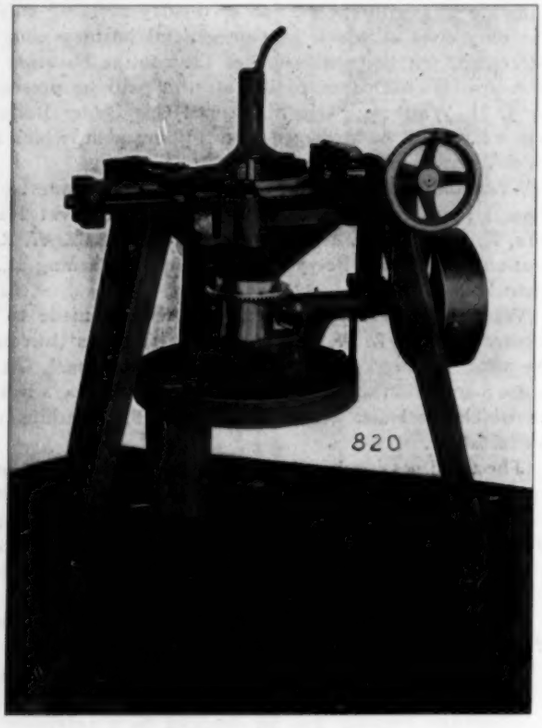
Enter Mexican Field.—A company represented by H. S. Hull, of St. Louis, and Walter B. Hull, of Mexico City, has applied to the government of Mexico for a concesion to manufacture locomotives, engines, boilers and automobiles. The applicants state that the company is willing to invest $1,000,000, and wishes to establish the works near the City of Mexico, commencing the construction within a year.

SIX SPINDLE RADIAL DRILL.

The Garvin Machine Co., New York, has put on the market the six spindle radial drill shown in the accompanying illustration. The special drill shown is intended for drilling the spanner holes in small hardware and machine parts all at one operation.

The work is clamped in the center, and the six spindles are fed in simultaneously toward the center, by bell-crank-levers, attached to a central ring, moved by worm-gear and hand-wheel. The machine is light-acting, and capable of very rapid action; and can be operated by boys, to great advantage.

The spindles are hardened and ground, and run in bronze bearings, and are fitted with ball thrust. Each spindle carries a bevel pinion, driven from one large central gear, with teeth planed to perfect form, so they run at high



SIX SPINDLE RADIAL DRILL

speed without noise. A jig is mounted in the middle; and chips and oil are led down through a central bowl to the chip pan and oil reservoir, fitted with sieve below, and cannot come in contact with the gearing or running parts of the machine. The machine will drill holes from the smallest up to ¼ in., with a travel of 1 in. The weight of the machine is 1,025 pounds.

PATENT PUBLICITY IS COSTLY.

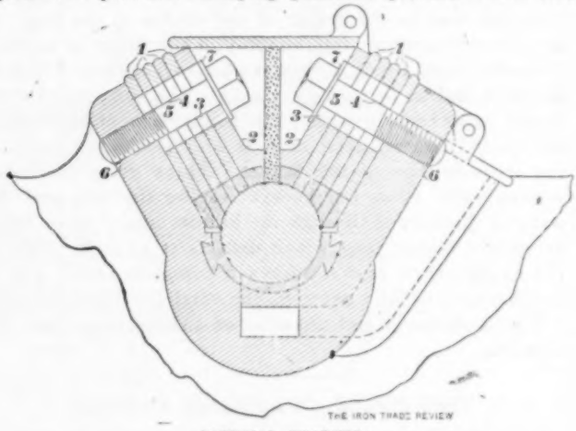
WASHINGTON, Nov. 28—The operation of the new trade-mark law has greatly increased the amount of printing necessary in connection with the administration of the United States patent office, but it is stated that the proposed extensive reductions in the interest of economy at the Government Printing Office will not affect this branch of the Government. It is possible, however, that after Congress meets, an effort will be made to cut down the $400,000 annual printing bill of the Patent Office, by abandoning the publication of the record which is used so extensively for reference purposes by all patent attorneys.

The principal expense incurred in connection with the recording of patents is for the publication of the *Patent Office Gazette*, which is printed weekly, monthly, semi-monthly, semi-annually and yearly.

JOURNAL BEARING.

Theodore C. Frost, has invented a journal bearing and assigned the patent to the J. A. Fay & Egan Co. The invention consists in providing a bearing with movable take-up strips whose edges are adapted to take against the journal and which are arranged to be held rigidly in place for forming the bearing.

In the accompanying illustration, 1 represents take-up strips whose inner edges take against the journal. These strips are independently movable. They are preferably given adjustment so that the bearing edges of the strips may be relatively moved toward or from the journal for making just the proper contact against the journal for forming a proper bearing therefore. The strips are then rigidly secured in place and the bearing thus formed. If there should be any uneven wear against the strips or if the journal should become loose from other wear or cause, the securing means may be relieved and the take-up strips be again moved against the journal for again forming the proper journal fit between the bearing and journal. For permitting the proper movement or adjustment of the strips and securing them in place are provided clamping plates 2, provided with slots



JOURNAL BEARING.

3. The take-up strips are provided with slots 4. Bolts 5 pass through the respective slots of the clamping-plates and take-up strips and are threaded into the stationary part of the bearing as shown at 6, washers at 7 being interposed between the bolt-heads and clamping-plates. The inner edges of the clamping-plates and take-up strips bear against the journal. In order to prevent too close impact of the strips and plates upon the journal, they are pressed against the journal by hand or by means of a small stick of wood. The take-up strips collectively have parallel side faces, so that they may be readily independently pushed inwards toward the journal.

The American Mining Congress.—With the idea of broadening the scope of its activities the American Mining Congress, which recently held its annual session at El Paso, Tex., is endeavoring to interest the mining industries of the east and to add the products of that section to the precious metals which now form the chief subject of its study and discussion. A year ago miners of the eastern states were asked to prepare for the publication in the proceedings of the congress complete reports of their resources in all branches of the industry, but only a few responded despite the fact that the attendance at the recent meeting included many representatives from the east, who manifested an increased interest in the affairs of the gathering. J. A. Callbreath, of Denver, secretary of the congress, states that it invites the co-operation of all men engaged in the mining industry and that an attempt will be made to have the program of the next session represent all the phases of mining. The campaign for the establishment by the federal government of a department of mines and mining is being actively pushed by the congress.

THE NATURE OF TROOSTITE.*

BY DR. CARL BENEDICKS.

There are many points of view to be considered in this question, which, from a physico-chemical standpoint, is perhaps not so obscure as has been thought.

Nature of Troostite.

We may consider it fairly agreed that martensite at a high temperature is a solid solution of carbon, probably as a carbide, in iron, which, however, may contain 1.2 per cent a carbon or none at all. This solid solution is not stable below a certain temperature, but is transformed, when cooled slowly, into two constituents, cementite and ferrite, as a mechanical mixture, pearlite. If, on the other hand, the cooling is done rapidly enough, the solid solution remains in a more or less unchanged form, as martensite in an undercooled state.

Now Osmond has discovered—and other metallurgists have confirmed his result—that should the cooling be either less rapid than that required for only martensite to result, or too rapid for only pearlite, we get troostite, which from the first Osmond gives as a transition form between martensite and pearlite. Consequently, it is quite natural to assume that troostite is that part of martensite in which cementite has just begun to form (incipient pearlite formation), but that, owing to the rapidity of the cooling, the separate particles of cementite do not attain to such a size that they can be distinguished microscopically.

This is in keeping with the fact of the extreme case with which troostite is affected by reagents; also with the fact that the hardness of troostite, as Osmond, and lately Boynton and Kourbatoff, have proved, is less than that of the contiguous martensite which must of course contain more hardening carbon, but that, as Osmond found, it is by no means constant, and becomes less in proportion as the cooling is less rapid, and the martensite less saturated with carbon.

However, Boynton is not satisfied with this simple conception of the nature of troostite, but offers the paradoxical suggestion "that troostite is some form of carbonless iron." Recently, the author, after investigating in detail the microstructure, density, hardness, electrical conductivity, and other physical properties of carbon steel, came to the conclusion that the ferrite in steel with over 0.5-0.6 per cent of carbon is probably composed of iron containing a certain quantity (0.25-0.30 per cent) of carbon in solution. The author thereupon naturally turned, with the greatest interest, to Boynton's work, with a view to learning something of the properties of carbonless iron.

As to the reasons for Boynton's view, it may first be pointed out that no one has asserted that troostite as Boynton believes, is an intermediate form between hardenite and pearlite, and that therefore its proportion of carbon is constant—i. e. about 0.80 per cent. On the contrary troostite, according to Osmond, is an intermediate form between martensite and pearlite, and just as the proportion of carbon in martensite can vary between these limits. Boynton's discussion of his Fig. 10 is consequently entirely faulty, since he proceeds from the supposition that troostite contains 0.80 per cent of carbon.

However, it is not necessary to examine all Boynton's arguments, for he says himself that his theory falls or stands by the presence or absence of troostite in hypereutectoid steel.

Now, the fact is that what Osmond calls troostite can be obtained without any difficulty by quenching steel that is rich in carbon—say, for instance, 1.6 per cent. This difficulty Boynton tries to avoid by calling this troostite "sorbite," though without telling us wherein the difference may lie. The exhaustive researches carried out by Kourbatoff have shown no real difference, but on the contrary the strikingly characteristic similarity that both on being slightly heated (even to less than 200 degrees) deposit 1.35 per cent of carbon, but in a steel that was very nearly eutectoid, with 0.90 per cent of carbon, no trace of troostite could be discovered, in spite of the fact that the quenching was done in exactly the same manner; cooling from about 800 degrees in water at about 15 degrees; cylinders 200x8 millimetres.

This, however, is not so very hard to explain, if we proceed from a well known physico-chemical fact—namely, that if a substance is to be separated from a solution—for instance, common salt from water—that substance must in general be present in solid form to avoid supersaturation. Thus, in order that an eutectoid solution may crystallize and supersaturation be avoided, it is sufficient that one of the constituents produced by the dividing up of the solution has been separated.

Let us now start from the assumption that troostite represents the first stage of the resolution of martensite into ferrite and cementite. We can foresee, theoretically, in

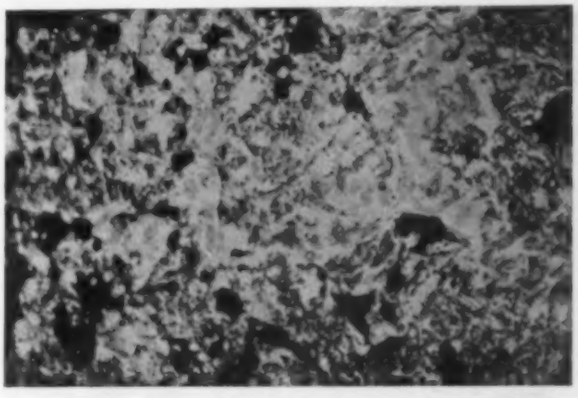


FIG. 1. CYSINGE STEEL C—1.35 MAGNIFIED 1,100 DIAMETERS.

cementite needles.

Still, there remains the undoubtedly correct observation of Boynton that a piece of 0.54 per cent carbon steel yielded troostite plentifully, while a piece of steel slightly over the eutectoid composition (with 1.11 per cent carbon) yielded no troostite. The author has himself obtained similar results: steel with 0.08, 0.45, and 0.55 per cent clearly yielded troostite, and similarly steel with 1.20 and conformity with what has been stated, that troostite should be produced by preference when martensite happens to be in contact with either ferrite or cementite.

This is emphatically confirmed by experience. When troostite from hypo-eutectoid steel is described, it is always as a zone that follows the borders of ferrite; within the martensite, where it is not in contact with ferrite, troostite has not been observed. And for the troostite that occurs in hyper-eutectoid steel, all observations seem to agree that troostite occurs by preference in contact with cementite. As an example, Kourbatoff's work may be quoted: "The center of the patches generally contains cementite," and this is also plainly shown by his photographs. The author had himself observed the same thing previously. A photograph (Fig. 1) from his work referred to above is reproduced, in which, in an area of austenite-martensite, are seen patches of troostite, but these almost invariably border on or enclose small sharp-cornered grains of cementite. These certainly occur without being in contact with troostite, but hardly vice versa.

*Abstract of a paper presented at the meeting of the Iron and Steel Institute Sheffield, England, Sept 29, 1905.

On the other hand, when steel is nearly eutectoid neither ferrite nor cementite separate, except just above the critical temperature; the "germs" that cause the beginning of the resolution of martensite into ferrite and cementite do not occur, and thus martensite can easily be preserved without troostite forming. In the same degree as the composition diverges from the eutectoid, the likelihood of the formation of troostite becomes greater. By this is not denied that a steel with 0.8-0.9 per cent of carbon can yield troostite. For this to be possible, however, the temperature at which the steel is quenched must be very near the critical temperature, so that the cooling may not be too rapid. As is known, Le Chatelier has produced, from steel with 0.9 per cent of carbon, a preparation that contains as much as 75 per cent of troostite, but that has only been possible by means of one of the practical artifices that one is accustomed to admire in the investigator: he quenched at the lowest temperature at which martensite exists at all in a stable condition, and which the maximum contraction enables one to ascertain.

In this connection the author wishes to point out a misconception to which the experiment of Le Chatelier's might easily lead. That is, that the steel at this temperature of maximum contraction is necessarily composed,

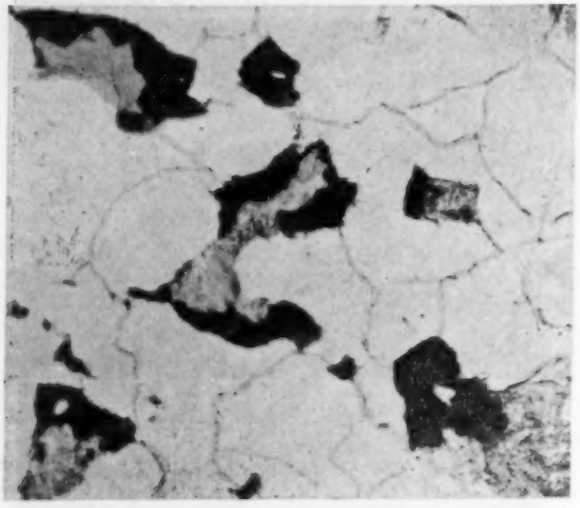


FIG. 2. SWEDISH CHARCOAL IRON C—0.08. MAGNIFIED 1,100 DIAMETERS.

partly or wholly of troostite, because this constituent is present abundantly after cooling.

A quenching may be ever so effective, yet it always takes a certain definite time—according to Le Chatelier's investigations this time is reckoned in seconds. During this time the reaction that accompanies a slow cooling always succeeds in taking place to a certain extent, and, generally speaking, one may assert that a structural figure obtained after rapid cooling always approximates somewhat to the stable condition at an ordinary temperature.

If, therefore, a quenched speciment consist exclusively of troostite, the possibility is always present that the specimen before cooling consisted of martensite, and that troostite came into existence during the quenching.

Le Chatelier, it is true, infers the stable existence of troostite at a high temperature from a slight bend in the dilation curve for a steel with almost eutectoid compose tion. This may possibly be right, but in view of Charpy and Grenet's later and more detailed examination of dilatations, this conclusion does not seem altogether certain. The facts, therefore, are in entire accord with the hypothesis that troostite is a pearlite with ultra-microscopically small particles of cementite.

The author would here point out that spiegeleisen is specially instructive in this respect. In that one can easily observe, for instance, after etching with tincture of iodine, typical troostite in an austenite-martensite area where it borders on cementite. However, among this troostite is found a continual transition to an extremely finely laminated pearlite, so that it seems to entirely depend on the power of the miscroscope as to where one places the boundary between troostite and pearlite.

A consequence of this conception of the nature of troostite is that it is a transformation in situ of martensite. There is reproduced in Fig. 2 another photograh respecting which the author believes that every one who has some experience in the microscopic study of minerals will agree that the form of the troostite areas gives an undeniable impression of the troostite being a product of transformation in situ of the martensite.

It was the author's intention to show this directly by photographing a definite spot that shows troostite, and then heating the specimen to a few hundred degrees. A fresh photograph of the same spot would then infallibly show that the patches of troostite had increased. However, he found this experiment was quite superfluous, since Kourbatoff had carried out detailed investigations into the increase of sorbite already from 130 degrees to above the critical temperature. He has found not only that troostite on being heated to 160 degrees increases at the expense of austenite-martensite, but also the important fact already mentioned, that troostite, when slightly heated, deposits needles of cementite. That this must be the case in a steel rich in carbon is a direct consequence of our view that troostite contains ultra-microscopic particles of cementite; the surface tension of these must strive to bring them together into larger particles, microscopically discernible, and these come into being as soon as a rise in temperature decreases sufficiently the inner friction in the metal.

Analogies to Troostite.

That the interpretations of the nature of troostite have been so vague and variable must be chiefly attributed to the fact that one has been unable to adduce any analogy to the appearance of a similar transition form. This seems to the author, however, to be far from impossible if one turns to liquid solutions.

When a constituent is separated from a liquid solution one not seldom observes an intermediate stage between homogeneous solution and mechanical mixture of liquid and separated substance. An example may be given, which is taken, it is true, from a branch of chemistry not universally studied, but which the author is familiar with from personal experience. If ammonia be added to a neutral solution of rare earths, a precipitate of hydrate is separated from the solution. If, however, the ammonia is very diluted (as it is used in fractionating these rare earths) no precipitate is obtained, but the solution at first remains clear. After a little while the clear solution becomes milky and opaque; it is impossible, however, to perceive any precipitate. This opaque mixture is a colloid solution of hydrate; it is fairly stable, and often precipitates flakes of hydrate; only after being vigorously stirred, or after the addition of a neutral salt, the solution then again becoming colorless. Similar phenomena in colloid solutions are well known to the analytical chemist.

Our knowledge of such colloid solutions is still defective, but it is very probable that they are to be considered as made up of exceedingly finely distributed solid particles in a liquid in which they are insoluble. Siedentopf and Zigmondy's arrangements for ultra-microscopic observation has furnished means of establishing directly the presence

of similar particles that are not visible with an ordinary microscope. In short, when we have to do with liquid solutions, we not uncommonly find an intermediate stage between homogeneous solution and mechanical mixture of solvent and separated substance. This colloid intermediate stage is characterized by the foreign substance occuring in a state of separation into small ultra-microscopic particles.

The analogy to martensite and to pearlite plus an intermediate stage, troostite, which in all probability contains ultra-microscopic cementite particles, is too obvious to require emphasizing. Other analogies could be given, but what has been said is sufficient to show that the existence of an intermediate form such as troostite is no isolated phenomenon, but that troostite seems to offer an interesting analogy from the province of alloys to the colloid solutions. Just as the colloid solutions have not yet been represented in any diagram, troostite has not found room in Roberts Austen's and Roozeboom's diagrams. Yet the colloid solutions are in stable equilibrium.

Certain fluids such as phenol and water, mix in all proportions at a temperature above a certain critical point. On cooling such a solution, homogeneous at a high temperature, there is formed, somewhat above the critical point an opalescent mixture, evidently a colloid solution, before the two fluids are clearly separated at a further lowering of the temperature. This opalescent intermediate stage can be reproduced both on heating and cooling, and preserved at an unaltered temperature for any length of time.

It remains to be seen whether this stable property also belongs to troostite. Le Chatelier's dilation experiments, already referred to, suggest that this is so, but it would be premature to draw any positive conclusions from them.

Troostite and Sorbite.

The terms troostite and sorbite are used without any consistency. In reality no essential difference has hitherto been shown to exist between these two constituents. It is characteristic of both to be transition forms between martensite and pearlite. Yet it does not seem unreasonable to make a distinction between them. In order to obtain a consistent nomenclature there can scarcely be any alternative but to revert to Osmond's presentation, in conformity with the principle of priority. Of troostite he says in his classic work: "In short, it is sufficient to suitably diminish the energy of the tempering in order to efface the structure of the martensite; and you have troostite." And of sorbite he says: "Sorbite may be considered pearlite that has not succeeded in being segregated, for want of time or for some other reason."

In conformity with this the author has already formulated in the work referred to, the difference that can appropriately be made between troostite and sorbite, and will venture to repeat it here:—

"If a piece of martensite or austenite has already begun to undergo transformation which ultimately results in pearlite, we have troostite.

"If the martensite has not succeeded in completely resolving itself into pearlite, we have sorbite.

"Troostite is the first, sorbite the last, stage of transformation between martensite and pearlite."

In the author's opinion one might set up this practical criterion: If the bulk is composed of martensite (+austenite), but certain parts become dark on etching, these are called troostite; if the bulk is composed of pearlite, but certain parts become dark on etching, these are called sorbite. But this question is and remains one of names.

For a detailed knowledge of the formation of troostite, we require still more experimental investigations in particular the determination of the rapidity with which a steel on hardening goes through different intervals of temperature—an investigation such as that which Le Chatelier has recently set on, foot—and the establishment of the influence of foreign substances on the formation of troostite.

However, more important and interesting problems seem to lie before us, and it appears advisable to wait for a detailed account of the liquid colloid solutions, with which troostite seems to have an unmistakable analogy, and details of which are more accessible.

A few words may be added concerning the hypothesis set forth with all reserve by Kourbatoff, namely, that troostite differs from martensite in that it is a solution of elementary carbon in iron, while martensite is a solution of cementite. This hypothesis seems to be of about equal value with an assumption that a solution of salt contains a certain hydrate of salt in solution, but that, on a lowering of temperature, the salt changes so as to appear in the solution as anhydride, to be finally combined again by further cooling with water and separate as a salt with water of crystallization. More logical is Baron Juptner's hypothesis, enunciated long ago, that austenite differs from martensite in being a solution of elementary carbon, a hypothesis, however, that also is entirely unconfirmed. Physical chemistry seems more and more to take the view that a substance that crystallizes from a solution occurs as such in the solution. Kourbatoff's hypothesis does not seem to make facts clear.

Conclusion.

In conformity with the experimental works of Osmond, Le Chatlelier, Heyn Hoynton, and Kourbatoff, and with his own observations, the author is led to the following conclusions:—

1. Everything we know at present points to the fact that Osmond has quite correctly defined troostite as an intermediate form between martensite and pearlite.

2. Between troostite and pearlite there is a continuous transition, and one is naturally led to the conclusion that troostite is a pearlite with ultra-microscopically small particles of cementite (containing also more or less hardening carbon). This hypothesis is the simplest and the most natural one to accept until it be shown that it is contrary to truth.

This is in keeping with the fact of the extreme case with which troostite is affected by reagents, with its varying hardness, which lies between that of martensite and that of pearlite, and with the fact that troostite, from a steel rich in carbon, yields cementite when slightly heated, as Kourbatoff has shown.

3. In all probability troostite is formed by a tranformation in situ of martensite, which implies that the carbon it contains must be the same as in the martensite from which it originates.

Boynton's assumption that troostite is pure B iron is without experimental or theoretical support. Similarly Kourbatoff's suggested theory, that troostite is a solution of elementary carbon in iron, is untenable.

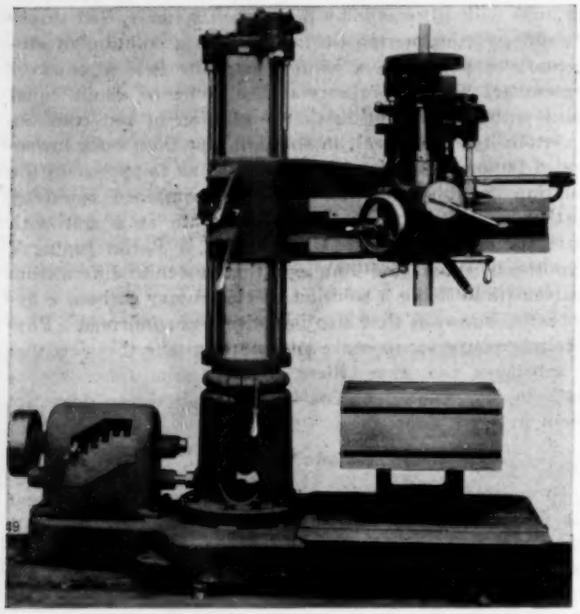
4. Troostite is formed from martensite by the appropriate lessening of the intensity of the hardening, especially in places that are in contact with ferrite or cementite; this is in perfect conformity to theoretic requirements.

5. As far as we can judge, troostite offers in the domain of alloys an interesting analogy to the colloid solutions.

Since the above was written, Rogers, in a paper on troostite, has taken into consideration the different arguments in favor of troostite containing carbon, contrary to Boynton's hypothesis. He says, however, that he fails to see why troostite should be B iron rather than R.

A NEW RADIAL DRILL.

This machine represents the latest product of the Bickford Drill & Tool Co., of Cincinnati, Ohio. Its capacity for drilling from the solid is rated at 2 inches for steel, and 2½ inches for cast-iron. Of new design throughout, the tool contains many improvements over its predecessors, but its chief characteristic lies in the speed box which, without the back gears or a clutch of any kind, gives instantly, with a single lever, six changes of speed.



BICKFORD RADIAL DRILL.

Referring to the diagram it will be seen that the speeds are obtained by means of a primary shaft C which turns the fixed gear D and sliding gear B, a tumbler plate A which fulcrums on shaft C and carries an intermediate gear O for transmitting power to any one of the fixed gears G, H, I, J, or K, an intermediate gear F for transmitting continuous motion from the fixed gear D to the loose gear L which carries a pawl and runs on the hub of a ratchet keyed to the secondary shaft M, and a device for automatically engaging the pawl or keeping it away from the ratchet.

The slowest speed is obtained by sliding the tumbler plate A to the last notch on the right when the intermediate gear E occupies the space between gears K and L, and the power is transmitted to the shaft M through gears D and L. Moving the tumbler-plate to the next notch brings the intermediate gear into engagement with gear K which makes gear B the driver and causes the ratchet on shaft M to run away from the pawl in gear L. Shaft M is therefore always running, for the moment its speed drops below that of gear L, the pawl in that gear acts automatically and keeps it turning at its minimum speed until gear B is again made the driver.

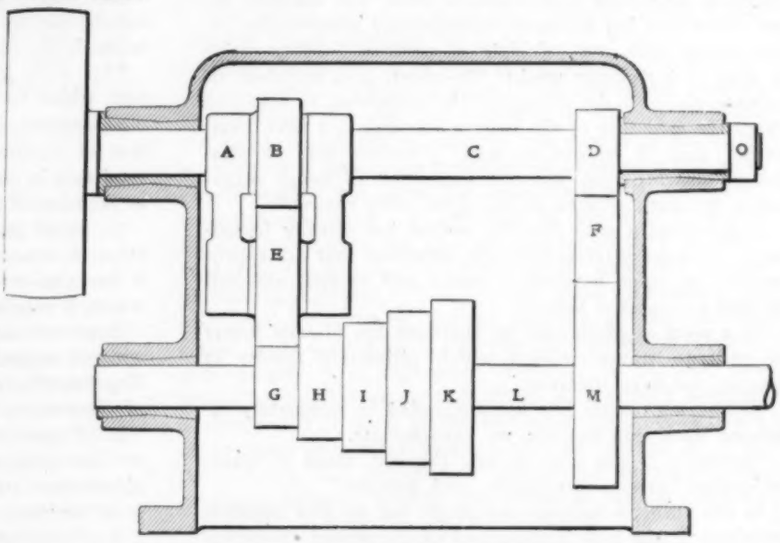
As the minimum periphery speed of the smallest driver gear G is but 182 feet less than the periphery speed of driving gear B, the shock which usually accompanies engaging gears broadside is reduced to a minimum, such as there is being absorbed by the belt. Another good feature of this drive is the high speed attained at low gear speeds. Shaft C runs at 350 revolutions per minute, while the periphery speed of no gear in the box exceeds 301 feet per minute.

This speed-box augmented by the back gears on the head, gives the machine twelve changes of speed, the range and gradations of which are shown in the following table:

No. of Revs per minute made by spindle.	Diameter of drills for which speeds are suitable.	Number of feet per minute at which drilling is done.	Number of feet per minute at which drilling should be done.
265.09	½	34.60	35.0
209.86	5/8	34.34	34.3
173.68	¾	34.10	33.6
143.91	⅞	33.07	32.9
122.84	1	32.16	32.2
104.29	1⅛	30.72	31.5
95.41	1¼	31.22	30.8
75.53	1½	29.66	29.4
62.51	1¾	28.74	28.00
51.79	2	27.12	26.6
44.21	2¼	26.04	25.2
37.56	2½	24.56	23.8

A comparison of the figures in the third and fourth columns indicates that the manufacturer has exercised care in the selection of gears, as in no instance do the cutting speeds vary from the theoretically correct by more than 0.84 of a foot per minute. Another point to which attention should be called is the irregular gradation of the speeds. The stock expression that "the speeds are in true geometrical progression" has become so common of late that many tool builders appear to think that no series other than a geometrical series is correct. That this is an erroneous belief is well exemplified in the example before us.

An inspection of the table will show that instead of giving a series of cutting speeds in which no speed is more than .84 of a foot too high nor .78 of a foot too low, the cutting speeds in the geometrical series are from 2.88 feet too high to .92 of a foot too low. In the one case the maximum error is but 2.47% and the average error but .834%; while in the other the maximum error is 8.57% and the average error 3.903%, or more than four and one half times greater.



SPEED BOX FOR RADIAL DRILL.

For the speeds to be in geometrical progression

they would have to coincide with the following series of numbers:

Geometrical Series.	Diameter of Drills.	Periphery Speeds.
265.09	½	34.60
221.90	5/8	36.31
185.81	¾	36.48
155.54	7/8	35.63
130.26	1	34.10
109.04	1⅛	32.12
91.31	1¼	29.88
76.43	1½	30.01
64.00	1¾	29.32
53.60	2	28.06
44.85	2¼	26.41
37.56	2½	24.56

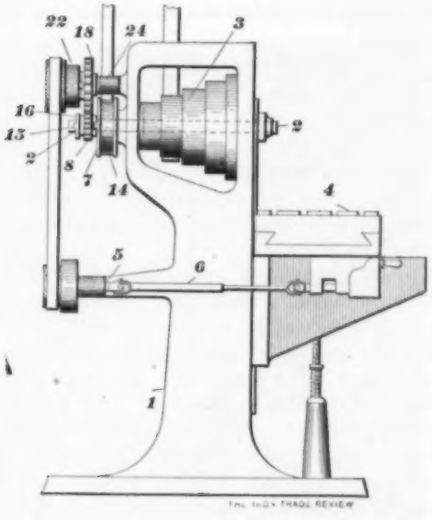
The machine is also furnished with a five-step cone drive, a constant or variable speed motor drive, a swinging or swiveling table, and a round, or double end base.

MILLING MACHINE.

E. J. McClellan has invented the milling machine which is shown in the accompanying illustration.

In machine tools, in which there is a main spindle for operating a cutting or other tool and a feeding table for carrying the article to be operated upon, which is driven from the main spindle, the latter driving means includes speed-changing devices, whereby the table can be fed at a number of different speeds relative to that of the main spindle; but it is sometimes necessary to obtain a certain speed of the work table relative to that of the main spindle different from any that can be obtained by such speed-changing devices provided on the machine. It is the object of this invention to provide means for obtaining such additional speed supplementary to those provided by the speed changing devices referred to.

According to this invention there is provided an arrangement by means of which at the will of the operator the usual speed-changing device operating the table-feed

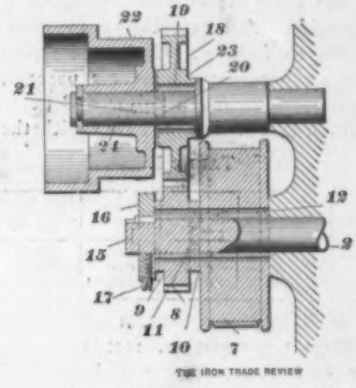


MILLING MACHINE.

can be disconnected from the main spindle and the table-feed driven from a source of power independent from the main spindle and also means in the nature of a clutch device by which the table-feed mechanism can be driven, either from the main spindle, or from a source of power independent of the main spindle.

The frame 1 of the machine is shown in the accompanying illustration as having a main spindle 2, carrying a cone 3, driven by a belt from the source of power. The feed-table 4 is operated from a shaft 5 by any suitable means, and is connected with the shaft 5 by a universally jointed extensible shaft 6. The shaft 5 is driven by a cone pulley which is fastened upon it.

The inventor provides a member driven from a source of power independent of the main spindle 2 and provides means whereby shaft 5 can be driven either from the main spindle 2 or from this additional member at the will of the operator. This member is a pulley 7, loose upon the projecting rear end of the main spindle 2. A pinion 8 is also loose on the spindle 2 and has hub ex-



SPEED CHANGING DEVICE FOR MILLING MACHINE.

tensions 9 and 10, the latter having recessed ears 11, diametrically opposite. A sleeve 12 is mounted loose on the spindle and loosely carries the pulley 7 and pinion 8. A collar 13 is mounted on the end of the main spindle 2 and is caused to rotate therewith by a key fitted in a slot in the spindle 2 and also a slot in the bore of the collar, but the fit of which key is loose enough to permit longitudinal movement of the collar on the spindle. The pulley 7 carries on its side adjacent the pinion 8 a pair of detents or lugs 14, arranged similarly to lugs 15 on the collar 16, and hence adapted to engage the recessed pieces 11 on the pinion 8. The diameter of the hub 9 is less than the diameter of the lugs 14, and said hub can rotate freely between them, as shown. The pinion 8, and hence the table-feed shaft, can be driven from this pulley 7 by loosening the screw 17, removing the collar 16, and then the pinion 8, reversing the pinion and replacing it, and then reversing the collar and replacing it and securing it by the set-screw. The recesses 11 will now be engaged by the lugs 14, causing the pulley 7 to drive the pinion 8, the latter being now free from the collar and shaft, as the lugs 15 will be outside thereof. By this arrangement the belt on the pulley 7 is not disturbed, nor the belt on the pulley 3, nor is the usual speed-changing gear adjusted; but by the reversal of the pinion 8 and the collar 16 the table-feed shaft 5 may be driven from the pulley 7 instead of from the main shaft or spindle.

Two more changes of speed may be obtained without additional driving members by making the gear 18 and the pinion 8 interchangeable. The gear 18 is shown having a hub 19 similar to the hub 10 of the pinion 8, having notches 20 engaged by lugs or pins 21 on the pulley 22, and the hub 23 corresponds to the hub 9 of the pinion 8. When pinion 8 is put on the shaft 24, the lugs 21 will enter its recessed pieces 11 and the notches 20 of the gear 18 will either engage the lugs 15 or the lugs 14, according to the manner in which the gear is put on the main spindle 2.

STEEL CASTINGS AND THE CONSTITUTION OF STEEL.

BY PERCY LONGMUIR.

Average steel castings, whether of surface blown Bessemer or open-hearth metal, usually contain about 0.35 percent carbon, and in castings this element rarely exceeds 0.5 percent. The higher the content of carbon the greater the tensile strength—within certain limits—but this increase in tenacity is always accompanied by a loss of ductility. As ductility usually figures on all specifications tenacity alone is useless. Generally an elongation of from 15 to 20 percent on 2 inches and a bending angle of 90 degrees is specified. A serviceable composition to meet the foregoing is as follows: Carbon, 0.3 percent; manganese, 0.8 to 1.0 percent; silicon, 0.2 percent, with sulphur and phosphorus as much below 0.08 percent as possible; from which it will be noted that with the exception

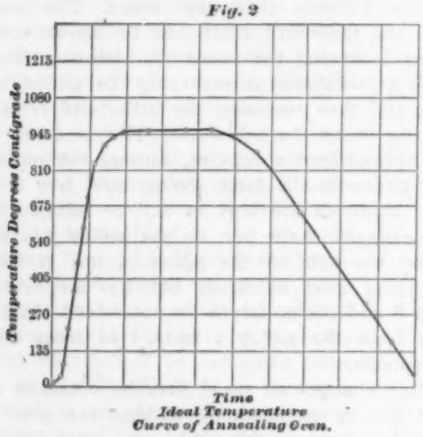
TABLE I.

Carbon.	Silicon.	Manganese.	Sulphur.	Phosphorus.	Max. Stress Tons per sq. in.	Elongation % on 2 inches.
0.29	0.07	0.16	0.07	0.06	23.7	10.0
0.29	0.14	0.92	0.06	0.02	30.9	7.5
0.20	0.04	0.38	0.15	0.06	18.2	4.1

of graphite, steel castings contain the same elements, though in different proportion, met with in cast iron. Carbon gives rigidity, manganese and silicon both assist in the production of sound castings, whilst sulphur and phosphorus are decidedly harmful. A general limit of manganese is found in a content of 1 percent, and silicon should not exceed 0.4 percent, but these limits will naturally vary with the class of work. The figures in Table I illustrate the influence of manganese and sulphur.

These values are obtained from unannealed castings and the first two show that with the same carbon but an increase in manganese of from 0.16 to 0.92 percent maximum stress is raised from 24 to 31 tons without a serious decrease in extensibility. The third example illustrates the influence of 0.15 percent sulphur and with this steel no form of heat treatment and no type of annealing would raise the extention above 10 percent. Had the manganese been 1 percent instead of 0.38 percent by suitable annealing

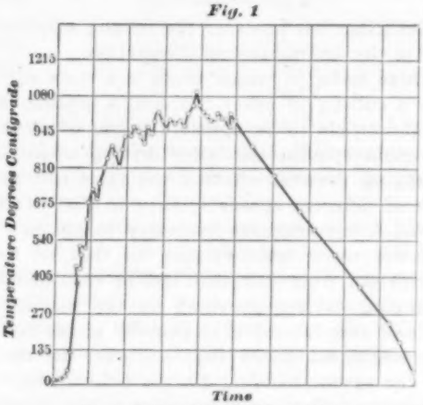
Fig. 2



Ideal Temperature Curve of Annealing Oven.

an extension of 20 percent could have been obtained. Evidently then manganese in steel as in cast iron, neutralizes the harmful effect of sulphur. This is owing to the fact that manganese sulphide has a much higher freezing point than iron sulphide. Thus on cooling, manganese sulphide solidifies early and its contraction is soon complete, further cooling and contraction tending to wedge the solidified globules of sulphide firmly in between the other constituents of the steel. Hence manganese sulphide occurs in isolated areas and owing to the pressure in a more or less globular form which does not destroy the continuity of the mass. On the other hand iron sulphide solidifies comparatively late in the cooling process, hence as the mass is cooling this still liquid sulphide is rejected by the solidified portions of their boundaries. Further cooling results in the solidification of the iron sulphide and its contraction. Therefore owing to late solidification and contraction, cohesion is seriously impaired. To this weak cohesion must also be added the fact that a brittle compound is distributed through the mass of the steel in a more or less connected form. No matter how thin this meshwork of iron sulphide may be—it most effectually destroys the continuity of the whole. As the strength of a chain is represented by that of the weakest link so the strength of a steel containing iron sulphide is represented by the cohesion between the sulphide and the other constituents of the steel.

Fig. 1



Temperature Curve of Annealing Oven
Total time including Cooling
93 hours.

Turning to the effect of carbon the following tests are taken from annealed castings and from bars cast on commercial castings:

Carbon %	Max. Stress Tons per sq. in.	Elongation % on 2"	Reduction of area %
0.08	20.0	40.0	60.0
0.28	28.0	33.5	45.6
0.51	35.4	22.5	27.3

These results were obtained from surface blown Bessemer steel, and are for cast annealed metal decidedly high, being almost equal to forged steel, except in the one property of resistance to shock.

Notwithstanding the present tendency to shorten annealing time the writer's experience convinces him as to the value of a long anneal, and results such as the foregoing which are regularly obtained, testify to the practical value of thorough annealing.

Annealing therefore determines the final properties of any steel castings, and to be successful it involves both time and temperature. The object is a two-fold one involving structural charges and the relieving of internal strains due to inequalities in the section of the casting. The latter is of much moment, and in the case of an intricate casting containing heavy and light masses of metal in juxtaposition careful treatment is required. Unless this is given an unannealed gray iron casting will under certain conditions prove of greater value under service conditions. A steel casting unrelieved of its contraction strains is a source of danger and given the right conditions the castings will fly. Therefore the cooling down from the annealing temperature must be slow and the slower the better the final result.

For castings containing from 0.3 to 0.5 percent carbon, a suitable annealing temperature is found between 900° and 950° C., and a suitable time at this temperature is found in three full days (72 hours).

A temperature record of an annealing oven is shown in Fig. 1. The dots represent temperatures—photographically recorded at intervals—of two hours, and this particular record is given in order to show the wide variations which may occur. The ideal record would be that of Fig. 2, in which the temperature steadily mounts, is evenly maintained, and then slowly falls. It need hardly be added that the nearer the actual curve to the ideal the better the final product. The steady fall of Fig. 1, on completion of firing, will be noted a feature which tends to equalize any inequalities in the thickness of the castings.

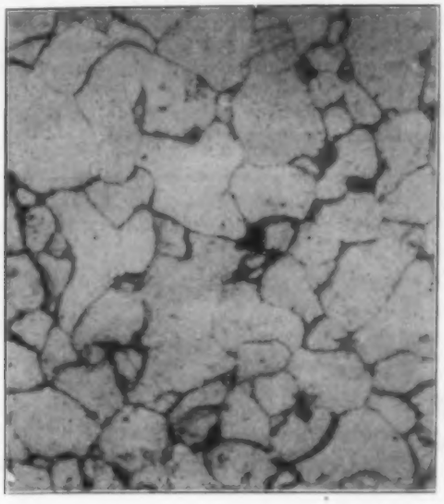


FIG. 3. FERRITE CONTAINING 0.08 PERCENT CARBON.

The structural changes induced by annealing are to some extent associated with the constitution of steel, and a few notes on this question are not out of place in considering steel castings. As already noted steels contain the same elements, but in different proportions, met with in cast irons. The only exception is that of graphite. Owing to the total content of elements other than iron being low it naturally follows that metallic iron is high. Reference to the tests given will show that an iron containing 0.08 percent of carbon is exceedingly ductile, being in this respect practically equal to copper. The addition of carbon to this ductile iron raises the tensile strength and lowers the ductility according to, within limits, the extent of the addition. This effect is due to the action of carbide of iron and not carbon alone on iron. In all steel castings the carbon is in combination with iron as a definite carbide Fe_3C.

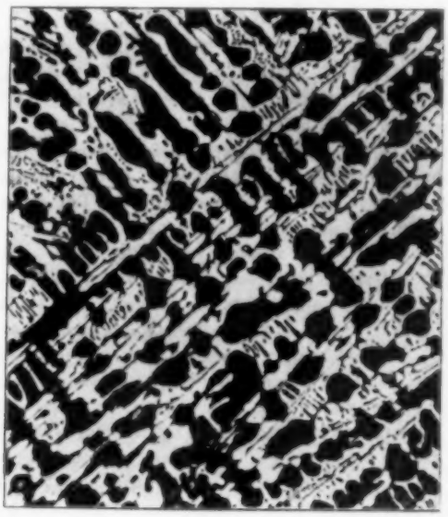


FIG. 4. WHITE CAST IRON CONTAINING 3.4 PERCENT COMBINED

This carbide is hard and brittle and if present in sufficient quantity gives the glass hard product white cast iron, corresponding to about 3 percent carbon. The best way of studying the distribution of carbide is by means of the microscope, which, given a suitably prepared section at once reveals the internal arrangement of the steel under examination.

FIG. 5. PEARLITE MAGNIFIED 1,000 TIMES.

The iron containing 0.08 percent carbon when so examined is found to possess the structure shown in Fig. 3, the lines of which represent crystal boundaries and the dark knots show the distribution of the relatively small amount of carbon present. The white crystals of iron are for convenience termed "ferrite," and the dark knots are termed "pearlite." Taking as the other extreme a white cast iron containing 3.4 percent combined carbon, its structure is that reproduced in Fig. 4. Here the increase in volume of the black areas of pearlite faintly shown in Fig. 3 will be noted as also the appearance of a new constituent which represents the hard carbide of iron, known as "cementite."

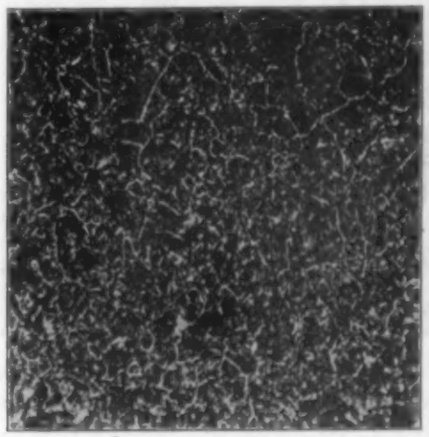


FIG. 6. STEEL 1.2 PERCENT CARBON, PEARLITE AND CEMENTITE.

Figs. 3 and 4 are given first in order to introduce the three constituents of ferrite, pearlite and cementite.

Ferrite is essentially ductile and soft, whilst cementite is exceedingly hard and brittle. Pearlite is a mixture of ferrite and cementite. Although in the two photographs given it is figured as a structureless substance, it is nevertheless at higher magnifications resolved into the two constituents indicated. In annealed steels pearlite is found

FIG. 7. STEEL 0.38 PERCENT CARBON AS CAST.

in a laminated form and then consists of alternate plates of ferrite and cementite. Such pearlite is shown in Fig. 5.

Cementite does not appear structurally free until a content of 0.89 percent carbon has been exceeded. Gradual increments of carbon to a structure such as Fig. 3 result in the gradual replacement of ferrite by pearlite until at 0.89 percent carbon the whole structure consists of pearl-

FIG. 8. SAME STEEL AS FIG. 7. AFTER ANNEALING.

ite. Further additions of carbon result in the appearance of structurally free cementite. The structure of a steel containing 1.2 percent carbon is shown in Fig. 6, it is built up of pearlite (black) and thin meshes of cementite (white). The latter increase in volume with further increments of carbon until the typical pearlite cementite structure of Fig. 4 is reached. Obviously then iron carbon alloys may be divided into three classes: (a) ferrite pearlite, (b) pearlite, (c) pearlite cementite.

Practically the whole of steel castings come within the first class, that is they contain free ferrite. The structure of such a casting in the condition as cast, is shown in Fig. 7, the carbon content being 0.38 percent. The angularity of the ferrite will be noted and the appearance of the structure as a whole is distinct and sharp. The same steel after annealing is shown in Fig. 8, which is chiefly characterized by the disappearance of sharpness and angularity. Chemically the two steels are identical and they are both built up of ferrite and pearlite. The difference is one of arrangement only. Thus in Fig. 7 the demarcation between pearlite and ferrite is most pronounced and the two constituents are entirely distinct. The effect of annealing is to break down this sharp demarcation and as in Fig. 8 the two constituents are as it were, interwoven one into the other. Apart from this interlocking, internal cohesion is also strengthened and the steel will now undergo considerably more deformation before breaking than it will in the unannealed condition. This feature is well shown

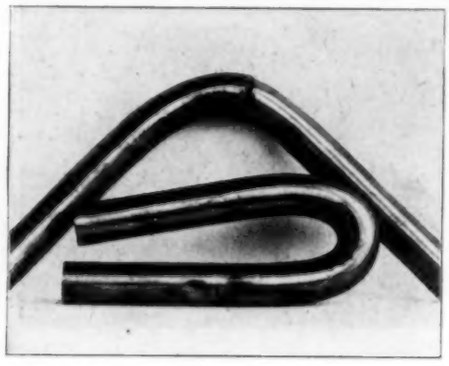


FIG. 9. ANNEALED BAR BENT.

in Fig. 9. The unannealed bar bent to an angle of 90° and fractured whilst the annealed one bent parallel the two ends were brought nearly together and no apparent flaw developed. This difference in behavior is due entirely to the structural rearrangement shown in Figs. 7 and 8.

Labor and Open Shop.

The following is an abstract from a paper, prepared by the Wilmington, Del., association, read before the National Association of Master Steel Metal Workers, at their recent meeting in Milwaukee:

"The open shop is the protest of American manhood against an intolerant, tyrannical and unjust attitude of organized labor as dictated by its leaders. The open shop has no complaint against rightful organization for rightful ends. It has no voice against unionism itself. Its protest is against that position which arrogates for itself all rights and denies any rights for others. The open shop stands for liberty and not for license. It will not listen to the cry of labor simply because it wears the badge of organization, though placed there by thousands of hands, and though its claims be vociferated by thousands of throats. It will answer the cry of labor wherever it comes with the badge and in the spirit of true manhood. In thus bearing itself the open shop opens the way for manly worth without distinction of class to carry to the home the food and the raiment and the other essentials which every home has an equal right to expect and receive.

"It is therefore in harmony with the dictates of justice and humanity that the open shop should exist, and the conflict for the principle upon which it stands should never cease while the imperishable truth that God has made all men free and equal remains to nerve human wills and inspire human hearts."

STRENGTH OF HYDRAULIC PRESS CASTINGS.

BY FRANK B. KLEINHANS.

In forming steel plates into various shapes, no better means is at hand than the hydraulic press. On these machines the large rear end of a Wooten boiler can be flanged at a single operation. Fig. 1 represents the general appearance of one of these machines. T is the table, C is the cap, and B is the base. Each one of these castings must resist the force of the main plunger. The stresses in each one of these castings are different, so the condition of the loading is different and the shape of the section varies with the different castings. The dies for flanging the work are located on the table in such a position as to bring the load as nearly central with the cyinder as possible.

Fig. 1 shows the distance between these centers of tension bolts and also the over all dimensions of the casting. The strength of the cap will first be determined.

Fig. 2 represents the half section AB of the cap. A seven-inch round core extends through the center of the

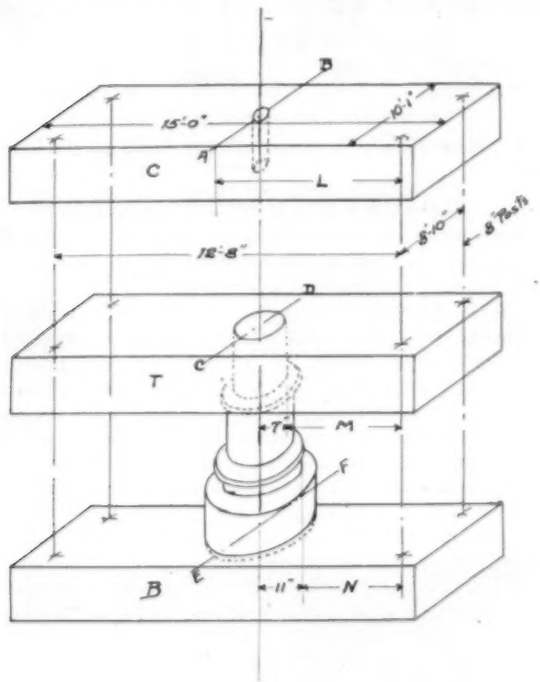


FIG. 1.

plate. In order to determine the section of this plate, we assume a section which our judgment would lead us to believe was about correct and then the section would be calculated. This section would then be increased or decreased, depending upon whether the stress came low or high.

Fig. 4 gives the assumed section. Divide the section into parallel strips of convenient width for calculation. From the center of gravity of each one of these strips, drop perpendiculars 1, 2, 3, 4, etc., as indicated. Enter up these sections and their corresponding area in a column as shown and obtain the sum of the areas which will be the area of the section.

Let A_2 represent this area. Lay off on a line XY, distances corresponding to the areas 1, 2, 3, etc. Draw the line XO and YO at 45° to XY. Draw rays from O as indicated. From any point C on the first perpendicular line draw CM parallel to OY. Draw CD parallel to O-1. DE parallel to D-2. Finally draw KM parallel to XO. The area of the figure which is thus marked out can readily be obtained by drawing a line PQ with a transparent triangle in such a position that the part cut from the figure will be equal to the area of the figure. Let A_1 equal area of triangle. The length of one side of this triangle is found to be 16½ inches, therefore the total capacity of the main cylinder is 500 tons. This total pressure can be exerted along a line in the center of the plate. The plate will thus become a beam with a line load in the center acting upward, and the reaction of the tension bolts acting forward. Fig. 4 shows one-half of the section AB of the cap. If we consider the pull in the tension bolts acting downward. Fig. 4 shows one-half of machine, we have

P = 225,000 pounds.
L = 76 inches.
I = Moment of inertia of the section.
and $I = A_1 \times A_2$.

From the vertex of the triangle drop a perpendicular to the base. This line passes through the center of gravity

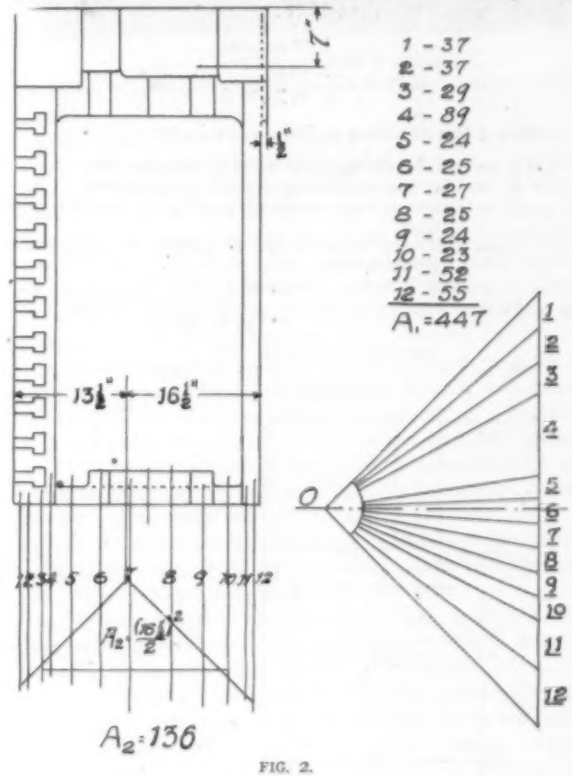


FIG. 2.

of the section.

Let

M = 76 − 7 = 69 inches.
I = $A_1 \times A_2$. Using the same notation as before

$$S_t = \frac{P \times M \times C_t}{I} = \frac{225{,}000 \times 69 \times 13.5}{136 \times 447} = 3450$$

$$S_c = -\frac{225{,}000 \times 69 \times 16.5}{136 \times 447} = -4210$$

The working stress should not exceed 3,600 pounds in tension and 9,000 pounds in compression. Either one of the above stresses are within the safe limit and therefore the section should be considered safe.

In order to obtain the strength of the table T, lay out the section CD as shown in Fig. 3, and from this construction, obtain A_1 and A_2. In the same manner as in the previous example P is found to be 225,000. In order to get the length L, lay out on a piece of cardboard, one half of the annular ring, where the plunger bears on the

table. Cut this section out and balance it on the edge of a triangular scale. The center of gravity is thus found to be 7" from the center of the table. The plate becomes an overhanging beam with two supports, M Fig. 1 being the arm through which the reaction acts.

$$S_t = \frac{P \times N \times C_t}{I} = \frac{225{,}000 \times 65 \times 12.5}{128 \times 467} = 3060$$

$$S_c = -\frac{225{,}000 \times 65 \times 17.5}{128 \times 467} = -4284$$

Both of these stresses are seen to be within the safe limit.

In order to obtain the strength of the base B, lay out the section EF as shown in Fig. 4. From the construction we determine A_1 and A_2. In the same manner as in the last example, lay out the ring upon which the cylinder bears on the base and find the center of gravity of this ring. This is found to be eleven inches from the center of the base. We then have:

$$P = 225{,}000.$$
$$N = 65.$$
$$I = A_1 \times A_2.$$

Using the notation as before we have:

Let S_t = Maximum working stress in tension.
S_c = Maximum working stress in compression.
C_t = Distance from center of gravity to remotest tension fibre.
C_c = Distance from center of gravity to remotest compression fibre.

$$S_t = \frac{P \times L \times C_t}{I} = \frac{225{,}000 \times 76 \times 16}{136 \times 567} = 3550$$

$$S_c = -\frac{225{,}000 \times 76 \times 14}{136 \times 567} = -3108$$

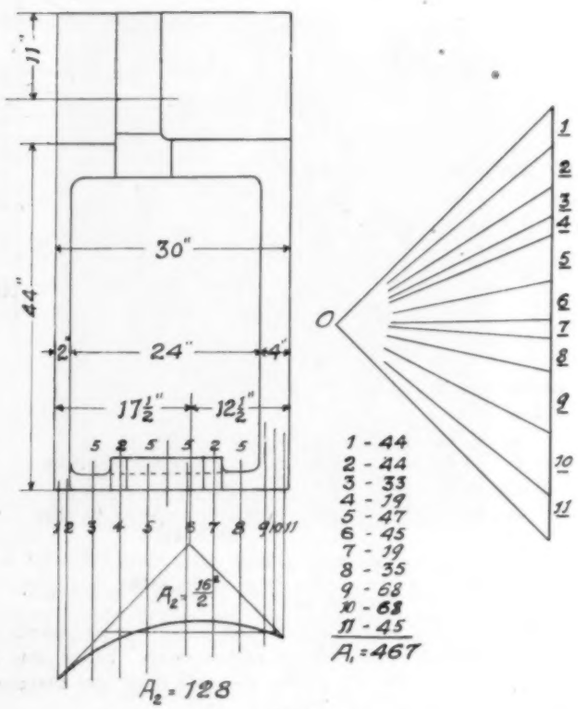


FIG. 3.

These stresses are also seen to be safe.

In a similar manner we consider the load acting on a line at right angles to those just referred to and obtain the strength of the section corresponding to it. Frequently there is considerable difference between the thickness of the metal at these two sections. It is not practical to taper off the metal to suit this difference and therefore the thickness of the metal in the different chambers should

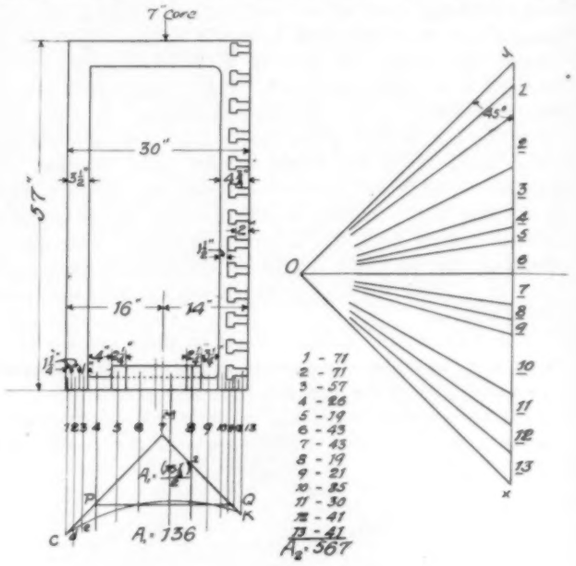


FIG. 4.

be proportionally increased or decreased as the case may be.

ECONOMY PLAN WORKS HARDSHIP.

Government Limits Publicity of Purchases to be Made. —Business Lobbyist Abuse.

(Special Correspondence.)

Washington, Nov. 28.—As the result of a decision just reached, in accord with the general policy of economy now characterizing almost all branches of the government, the navy department in the future will not advertise for bids for furnishing supplies and equipment for the various United States navy yards as has been the practice for years past. Instead published calls for proposals will be limited to those city newspapers published nearest the yards where the supplies are to be delivered. Thus, Brooklyn navy yard needs will be advertised only in the New York city or Brooklyn newspapers and purchases for the League Island navy yard will be announced only in the Philadelphia dailies. This plan of making announcements will in many instances be virtually valueless, however, especially where purchases are to be made for the navy yards at Pensacola, Fla., Bremerton, Wash., the newspapers of which cannot be expected to have anything approaching a national circulation. For Pacific Coast navy yard needs, moreover, the copy for advertisements must be sent from Washington to the Pacific Coast newspapers and issues of the latter containing the advertisements transmitted back east ere the eastern manufacturers are apprised of the needs of the department, with a delay of ten days or more.

The business of representing business firms before the departments engaged in purchasing supplies is just now being most energetically sought by a large number of more or less legitimate "attorneys" resident at Washington, some of whom it is charged are overstepping the bounds of propriety in their campaigns for clients. In some instances the "business lobbyist" merely offers his services for the submission of bids, etc.,—something that can be done just as well by mail—but in some cases manufacturers are approached with offers to have their particular products specified by the government officials in calling for bids in the respective classes involved and a few particularly bold individuals have, of late, it seems, approached manufacturers whose goods have long been specified (through no effort of their own) in government specifications and, it is said, have intimated that unless a retainer was forthcoming such designations would be discontinued.

SHOP WORK AT WORCESTER POLYTECHNIC INSTITUTE.

In the journal of the Worcester Polytechnic Institute of November a very interesting article describing their system of shop practice appears. In this institution the matter of practical shop work is carried on more completely and upon a larger scale perhaps than in most of the other institutions of the country, and therefore, what may be said of the system as it is found there is what may be expected in the main from a shop course in any college.

The shop training at the Worcester Polytechnic Institute is in its methods noted for two things, (*a*) the broad and comprehensive grasp of the needs of an engineering graduate, and (*b*) the necessity for keeping up to date in shop management and methods. So far as the student is concerned the shops are made strictly educational. They are an integral part of the department of mechanical engineering, the professor of mechanical engineering being also director of the shops.

The shops are also run as a manufacturing concern employing a number of machinists, molders, and pattern makers. The students are assigned definite hours in these shops, depending entirely upon the engineering course they are taking; that is to say, whether they are fitting themselves for mechanical, electrical or civil engineering. The students in mechanical engineering are required to take the most extended shop course.

The instruction is at all times such as the future engineer will need and not that suited to the mere artisan or workman.

The complete shop course in mechanical engineering is about fourteen hundred hours, and of this amount one-half is at the disposal of the instructor in machine construction. Five hundred and forty hours of the total time is called "Summer Practice" and is given during the month of June, one hundred and eighty hours in each of the first three years. This summer practice is continuous work, ten hours per day until completed, and is common to all the institute courses; for students taking the course in civil engineering it means field work, and for those taking the course in chemistry, chemical laboratory.

FIG. 1.—VIEW IN PATTERN SHOP.

The work in pattern making is common to all students since the selection of courses is not made until the end of the freshman year. During the sophomore year the electrical engineering students receive shop instruction during both terms and the sophomore summer practice. The civil engineering students receive shop instruction during a portion only of the sophomore year. For students in mechanical engineering the shop practice forms a part of each of the four years of the course.

The freshman or first-year work is designed to train the student in the principles of pattern making, the work beginning with the simpler forms of patterns and advancing as rapidly as the ability of the students warrants.

Pattern making is first taken up in its relation to the foundry and the questions of draft, shrinkage and allowances for finish are studied. The question of selecting the proper lumber and the method of its use in pattern construction is also included in the elementary pattern making course.

FIG. 2.—VIEW OF THE FOUNDRY.

The advanced pattern making work includes a study of cored sections and the pattern as a part of a machine. While at work on the above course the student is kept in close touch with the foundry and the machine shop and every point made by the instructor can be checked by actual commercial examples. In the pattern shop all those machines that are common to pattern making establishments are open to the student and pattern costs can thus be made a part of his course.

A short course in foundry work is introduced in the freshman year. This course is used principally as a method of checking his work in pattern making and is a beginning of a thorough course in foundry usages and management. As in the other branches the foundry is carried on as a business proposition and castings are made for outside parties. This adds variety to the work and gives the student an opportunity to take part in the production of work which runs from light machine parts to large charcoal iron castings weighing over two tons.

At the beginning of the sophomore year a start is made in machine practice or metal work. The course as arranged is expected to give the student a knowledge of the use and capacity of all the ordinary machine tools. The students have access to and receive instruction in the use of lathes for both light and heavy work, planers, shapers, milling machines, gear cutters, boring mills, grinding machinery, drilling and chucking machinery and flat turret machines of various makes and sizes; also all the small tools, jigs and fixtures that are necessary for the economical manufacture of a line of light machinery. Instruction in the use of these machines is by lectures and by using machines themselves. The student is expected to do work on any machine in the shop by the end of his sophomore practice.

During the sophomore year the students start on their forge work, which includes the effect of heat on different metals, welding wrought iron and various grades of steel, tempering and annealing, tool making, heat treatment of high speed steels, work with power hammer and small drop forging.

In the second term the use of high-speed steels is taken up with the classes and the students provide themselves with tool holders for the purpose. A study of cutting speeds, feeds and their effect upon production, is begun

at this time, and the student is shown three limiting features of production: (*a*) what the machine will stand, (*b*) what the work will stand, and (*c*) what the tool will stand.

A beginning is also made during this year in the practice of estimating the time necessary to perform work in the different machines used. Upon being assigned a job the student receives the necessary blue prints and rough stock, and he is required to estimate the necessary time for completing the job.

A complete index is kept and these job cards show at any time the student record, a different color being used for each year of the course. While the estimating of time must at the first be pure guess-work it soon ceases to be so, and the student is encouraged to keep notes of the speeds and feeds, used in performing the several jobs, that he may more intelligently estimate the next one. This is in line with the idea that the student is later in his course to take up the study of estimating time of building parts of a machine.

In the foundry the sophomore also has at his command an opportunity to compare costs of molding, coremaking, and the many operations incident to foundry practice. The foundry is a new, modern, and well lighted building, and is equipped with two cupolas, a large core oven, a traveling crane, molding machines, core-making machines, fans, rattlers, etc.

The work of the junior year is largely advanced machine construction, and a study is made of jigs and fixtures and their usefulness in duplicate work. The use of high-speed

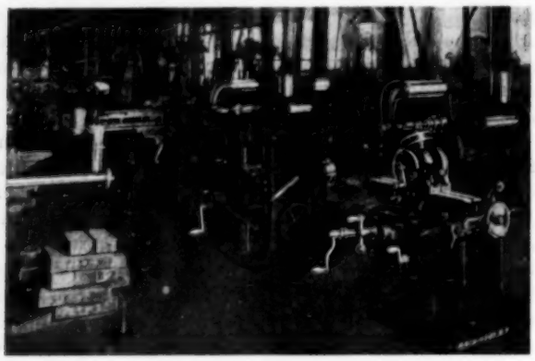


FIG. 3.—MILLING DEPARTMENT, MACHINE SHOP.

steels is given further consideration. Besides their regular line of work the shops build experimental machines for outside parties. This gives the student an opportunity to study the methods of doing work of this kind. He also learns of the increased cost made necessary when building a first or experimental machine over the cost of producing such machines in large numbers, when the jigs and tools have been developed, and the workmen have become skilled in their use.

The shop work for the first term of the senior year is devoted to a study of methods of cost reduction and cost accounting in the shops. Fifty pieces are taken as delivered by the foundry and are machined complete, ready for the stock room. A comprehensive study is first made of all the machines, tools and fixtures that might be used in making the part, and the piece is then machined in several ways to determine which tools, machines, etc., are best suited to the work. After finishing these preliminary tests, and having settled upon the machines to be used, tests are made to determine the most desirable feed, speed, and depth of cut to use. To find this, several combinations are tried, each being carried to a point where the machine, the work, or the tool, will stand no more. The results of these tests are studied and a decision arrived at for the best and most economical speed, feed, and depth of cut for roughing out the several surfaces. Various methods of finishing out surfaces are then tried and the best one adopted. The order in which the operations should be performed, is next taken up and different arrangements tried and a conclusion drawn.

The several conclusions are then discussed by the instructor and students, and when finally decided upon, are tabulated. The time taken to perform the various operations is carefully taken, notes are made of all that occurs in each case, and the results tabulated.

The class is arranged in groups and turns are taken in timing operations. The tabulated report is studied carefully to determine whether or not some of the operations can not be shortened by improving (*a*) the tools, (*b*) the machines, (*c*) changes in the pattern, (*d*) methods in the foundry. Any changes that promise even a slight improvement are tried or recommended for trial. Jigs, tools, and fixtures designed by the seniors in this work are built by the junior class and are tried out before being placed in the tool room.

The work of the second term of the senior year is taken up with the professor of mechanical engineering, and deals with the questions of shop management from the standpoint of the office man. Opportunities are here given the student to learn methods of superintending, and a study of employment questions is made. As the shops have a weekly payroll of good dimensions the student gets practice in making up such payroll and in the different methods

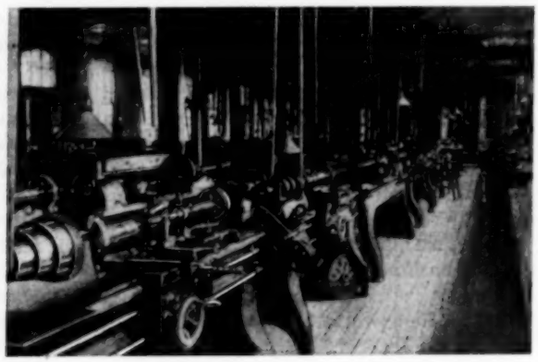


FIG. 4.—LATHE DEPARTMENT, MACHINE SHOP.

that are employed in keeping the time of employees.

A study of the duties of the purchasing agent is made and the different price lists and discount sheets discussed. Methods of keeping track of the work as it passes through the shop are taken up, stock lists made out, systems of billing and methods of foreign and domestic shipment are studied, and the student assisted to make as complete an analysis of office methods of superintendence as his time will allow. Here as in all the shop work taken, the line between the engineer and the workman is never lost sight of either by instructor or student, and the whole training is given with the idea that the graduate is to become a master in his line of work, an employer of men, and a director of enterprises.

The responsibility for attendance rests entirely with the students. While they are expected to be present as assigned for their shop practice, they are not required to be there nor to make up lost time. Each student is given an opportunity to work under an instructor in the shops at regular intervals, and he is marked according to the use he makes of these opportunities. If his average for the term falls below 60, he must repeat the work the following year, or else annul his condition by passing a satisfactory examination.

OPEN SHOP PRINCIPLE

Reaffirmed and Strong Addresses made at Citizens' Industrial Association.

The Citizens' Industrial Association of America at the sessions of a two days' convention at St. Louis adopted a resolution providing for the prosecution by federal authority of "such organizations of labor as in their conduct and purposes are manifestly labor trusts." The following principles were reaffirmed:

1. The open shop, demanding only good faith and fair dealing; it discriminates against neither union or nonunion labor.

2. The freedom of the apprentice and the right to the individual to have a trade and to follow it.

3. The right of private contract, with equal obligation upon employer and employe.

4. The right to work; limiting the hours of labor whether of brains or of hand is a matter of mutual agreement, not a subject for arbitrary legislative enactment.

5. The enforcement of the law.

The election of officers resulted as follows: President, C. W. Post, Battle Creek, Mich.; first vice president, J. W. Van Cleave, St. Louis; second vice president, F. C. Nunemacher, Louisville; third vice president, A. C. Marshall, Dayton, O.; secretary and treasurer, Major A. C. Rosencranz, Evansville, Ind.

Almost 500 delegates were present from every state in the union. President Post in outlining the aim of the association stated that it was to look out for "the humble citizen who is neither an employe nor employer, but who gets the worst of it every time." Elbert Hubbard of East Aurora, N. Y., sent an address in which he said: "The labor union is a good thing with an open shop, but the closed shop is all wrong."

F. C. Nunemacher, Louisville, said in part: "The question of the open shop is one vital to the welfare of our country. It means a square deal for all. Nothing can be more fair for all. To the nonunion workman, the open shop is the only salvation. There any man can get all the privileges to be derived from his calling. The labor unions are not fair. They menace the life, liberty and property of citizens and are therefore unconstitutional. If any state legislature should pass laws like the articles governing labor unions, they would be declared unconstitutional. The employer who runs a closed shop, menaces and abridges the liberties of citizens of the United States. The open shop means Americanism. It means the right to do as one pleases, disregarding the restrictions of unionism. If you are to be Americans, do not hesitate to declare for the open shop."

"Public Ownership" was discussed by N. O. Nelson of St. Louis, and a number of other addresses were delivered, all by experts in their various lines.

Cement for Iron.—Sulphur flowers, 6 parts; white lead, dry, 6 parts; powdered borax, 1 part. Mix well by sifting and keep as a dry powder in well-closed tin box. To prepare this for use, make a thin paste with strong sulphuric acid; press this together at once. It will become hard in five days.—[American Machinist.

The William Tod Co., Youngstown, O., is to install new engines at the Fanny furnace of the Cherry Valley Iron Co., West Middlesex, Pa. Improvements at this furnace will include the addition of three hot blast stoves, two new blowing engines, a brick office building and a brick engine house 100 x 50 ft.

CANADIANS OPPOSE TARIFF ADVANCE.

(Special Correspondence.)

TORONTO, CAN., Nov. 28.—General opposition to any radical advances in the tariff duties on various metals and metal products was voiced by a large number of manufacturers who recently appeared before the Dominion Tariff Commission which is endeavoring to re-adjust the tariff schedules so as to satisfy the diverse interests of the country. A large delegation of consumers of tin plate asked that no duty be placed on that article, A. E. Kemp of Toronto, who acted as spokesman, declaring that the time had not yet arrived when tin plate could be profitably made in the Dominion. His position was indorsed by a number of users of tin cans. The makers of metallic roofing, through J. O. Thorn of Toronto, urged that no duties be placed on copper sheets or plate, as no Canadian mill is producing the variety of metal required. He asked that the free list be extended to include rolled iron or steel sheets No. 17 gauge and thinner, Canadian plates, flat galvanized iron or steel sheets and some other articles now dutiable. He favored, however, a substantial increase in the rates on British goods such as galvanized sheet iron or steel sheets, etc.

Stove manufacturers insisted that a twenty-five percent duty was not sufficient protection against American competition and suggested an additional duty of one cent per pound. Wire fence manufacturers petitioned that no change be made in the duty on wire. Officials of the Massey-Harris Co., largest maker of agricultural implements in the Dominion, asked that duties on the lines it manufactured be evened up about twenty-five percent. At present the rate on the principal items of farm machinery is twenty percent, though some classes are charged 25 percent.

As a result of the hearings, it is believed that no substantial increases are to be made. The Finance minister told one deputation that the government was bound to consider the question of revenue and deprecated the raising of the tariff to such an extent as to endanger receipts from imports.

NAVY YARD BIDS AND AWARDS.

(Special Correspondence.)

WASHINGTON, D. C., Nov. 28.—Among the proposals opened at the bureau of supplies and accounts of the navy department on Nov. 14, were bids for one magnetic metal separator and dynamo for the League Island, Pa. navy yard. The proposals were as follows:

Drew Machinery Agency, Manchester, N. H.	$172.00 and $150.00
J. S. McCormick Company, Pittsburg, Pa.	225.00
Manning, Maxwell & Moore, New York City	325.00
S. Obermayer Co., Cincinnati, Ohio,	300.00

For furnishing one 3-in. hollow turret lathe for the League Island yard the only proposal submitted was that of Manning, Maxwell & Moore, who offer to fulfill requirements for $4,650.

For one open side planer for the League Island yard two bids were submitted—the Detrick & Harvey Machine Co., of Baltimore, Md., $9.15, and Manning, Maxwell & Moore, of New York city $9,165.

The contract for ammunition hoists for which the ordnance bureau of the war department opened bids on Nov. 3, went to Dietrick Bros. Theirs was the second lowest bid but promise of quicker delivery won them the contract. The ordnance office will on Dec. 7, open bids for fifty 2½-in. Lyle life saving guns.

The Japanese government has placed orders for a large quantity of navy yard tools with the Columbus Pneumatic Tool Co., Columbus, O.

NEWS FROM MANY INDUSTRIES.

New Buyers:—

The Niles, O., Boiler Co., has increased its capital from $100,000 to $150,000.

The Murphy Iron Works, Detroit, Mich., has been incorporated with $250,000 capital stock and with $35,000 capital in Illinois.

The Charles Edge Tool Co., Millbury, Mass., has been incorporated to deal in tools with a capital of $10,000. The officers are: President, M. C. Buck, and treasurer, F. C. Wheeler, Millbury.

The Atlas Machine Tool Co., has been incorporated to deal in machinery and tools with a capital of $50,000. The officers are: president, D. A. Trefethen and treasurer, and J. W. Stavers, Taunton, Mass.

The American Roller Wire Screen Co., of Buffalo, N. Y. and Guthrie, I. T., has been incorporated for $1,000,000, by Ford Mansell, Toronto, Can., Geo. M. Kellogg, Hornellsville, N. Y., and G. Pattison, Guthrie.

The Kimble Car Co., Zanesville, O., has been incorporated for $100,000 by Andrew Kimble, A. B. Offenbacher, M. A. Offenbacher, H. G. Schiedt, and J. F. Schiedt. A combination summer and winter street car will be manufactured.

The Standard Stamping Co., Albion, N. Y., has been incorporated to manufacture metal stamping tools, machines, etc., with a capital of $75,000. The incorporators are: Andrew F. West, William Dicks and Albert C. Burrows, Albion.

The Crescent Rotary Engine Co., has been incorporated at Spokane, Wash., for $1,000,000 and is planning the erection of a factory. H. I. Call, inventor of a new style of rotary engine, is president; W. J. DeCamp is vice president, and W. H. H. Kelly is secretary.

The Madden & Morrison File Co., Middletown, N. Y., has been incorporated to manufacture files and rasps with a capital of $60,000. The incorporators are: Eugene Horten, John H. Morrison, Frank M. Madden, and Warren G. Horten, all of Middletown, N. Y., and John H. Yocum, Newark, N. J.

The C. F. Wendland Engineering & Construction Co., New York city, has been incorporated to manufacture engines, boilers, etc. The capital is $30,000. The incorporators are: Charles F. Wendland, Charles Beeckman and Peter Wendland, Brooklyn.

The John Kenny & Co., Newburgh, N. Y., has been incorporated to manufacture bridges and structural work. the incorporators are: John Kenny Jr., M. C. Kenny, and Benjamin McClung, all of Newburgh. The company is capitalized at $30,000.

The Jackson Fence Co., Jackson, Mich., has been incorporated with a capital of $50,000. A new factory will be put up at once. The officers are: President, P. H. Withington; vice president, Thomas A. Wilson; secretary and treasurer, P. L. Carter, and general manager, B. A. Carlinghouse.

The Booth Drop Forge Co., Borough of Queens, has been incorporated in New York with a capital of $9,000, to conduct a general machine shop. The incorporators are: James W. Booth, 68 Third Place, Brooklyn; Harry B. Bradbury, 61 Wall street, New York, and I. L. Donnely, 85 Cedar street, New York.

The Fort Wayne Rolling Mill Co., Fort Wayne, Ind., has been incorporated to manufacture iron and steel. The capital stock is $35,000. The incorporators are: Edward F. Yarnell, B. A. Hegeman Jr., H. C. Rockhill, Noie Cook, J. P. Evans, H. E. Frazier, Robert Millard, H. H. Hainer, Sam Braudy and W. J. Wesey.

The Turbine Locomotive & Car Co., 81 Orange street, Newark, N. J., has been incorporated to manufacture engines and appliances for the generation of steam, electric, gasoline, etc. The incorporators are: Stacey Wilson, 200 Broadway, New York; Robert J. Keith, 116 Nassau street, and Albert G. Mabee, 81 Orange street, Newark, N. J. The company is capitalized at $500,000.

The Charles Longenecker & Co., New York, will manufacture hydraulic and road machinery. The capital stock is $35,000, and the incorporators are: Johannes Bruyn, 71 Rolstan avenue, South Orange, N. J., Sheldon Stearns, 1251 Pacific street; Charles D. Bruyn, 102 Lefferts plance; George Frank, Gergen and Nostrand avenues, all of Brooklyn, and Robert W. Malony, Kingsbridge, N. Y.

The Arctic Machine Co., Akron, O., has been organized with a capitalization of $400,000 to operate the ice machine department of the Aultman Co., which it has purchased. The organizers are: H. H. Timken and W. R. Timken, of the Timken Roller Bearing Axle Co.; A. B. Clark, of the Canton Steel Roofing Co.; F. T. Zollinger, of the Canton Pump Co.; W. C. Lablin, of the Canton Bridge Co.; R. W. Gallagher, Gordon M. Mather, of the Cleveland Axle Mfg. Co.; E. G. Tillotson and A. R. Horr, of Cleveland, and F. H. Goff.

New Construction:—

The Knoxville Iron Co., Knoxville, Tenn., contemplates erecting a steel plant at Lonsdale.

W. J. Murray, Washington, D. C., will erect a machine shop on a site recently purchased.

The American Radiator Co., is to construct a plant at Hull, Eng., which will employ about 700 men.

Ground has been broken for the new blast furnace to be erected in Haselton by the Republic Iron & Steel Co.

The Potthoff & Fry Iron Works, Cincinnati, has decided to erect on a site recently purchased what will be the second largest structural iron plant in the city.

The Chapman Iron, Coal & Coke Co., Goshen, Va., whose plant was recently destroyed by fire, will rebuild its machine shop and foundry in the near future.

The Glazier Stove Plant, Chelsea, Mich., will be enlarged by the erection of a three-story building for the manufacture of gasoline stoves and steel ranges. A "welfare" department will also be built.

The Baldwin Locomotive Works, Philadelphia, Pa., has completed plans for another building to be devoted wholly to the manufacture of electric trucks. About 1,500 employes will be required.

The C. H. Cowdrey Machine Works, Fitchburg, Mass., will erect a two-story brick shop 50 x 98 ft. for which no new equipment will be required. The company manufactures special machinery.

The Shelby Tool Works, Shelby, O., has about completed its piercing mill which will be put in operation this week, running three shifts each twenty-four hours. It is understood that those men are needed.

A bridge of two spans 400 ft. each, and a steel viaduct with concrete abutments will be built over the Kansas river by the Missouri-Kansas Transit Co., Kansas City, Mo. A concrete tunnel of 3,700 ft. will also be built, the whole costing about $4,000,000.

The Essex Foundry, Newark, N. J., finds it necessary to erect a new building which will be 113 ft. long and 75 ft. wide. New molding machines will be installed besides other necessary equipment. When the improvements are completed the daily capacity will be about 50 tons.

Messrs. Payne & Joubert, of New Orleans, who are interested in the erection of a large machine shop and foundry in Birmingham, land having been purchased already near East Birmingham, a short distance from the city proper, are working on plans to put up the plant in a short while. The

concern will be as large, so it is stated, as any foundry and machine shop in this district.

The Monarch Coupler & Steel Casting Co., Detroit, Mich., will start work at once upon its new plant to cost about $75,000. The Detroit Seamless Steel Tube Co., in which W. C. McMillan, president of the Monarch Coupler & Steel Castings Co., holds a large interest, has doubled its capacity the last six months, its monthly production now being about 500 tons of steel tubes. Considerable new machinery has been installed.

The Milwaukee Gas & Coke Co., Milwaukee, Wis., has under construction 80 additional ovens which it expects to put into operation about the first of the year, thereby increasing the daily production to about 1,100 tons of coke. The construction of a further battery of 80 ovens is now under consideration: if built, they will make a total of 240 ovens with a capacity of about 1,700 tons per day. The company has recently increased its capitalization to $2,000,000.

The Pennsylvania Swedish Iron Co., Pittsburg, is erecting a plant at Cheswick, Pa., the main building of which will be 80 x 120 ft. and will contain six knobbling fires, a 7,000-lb. hammer, an air compressor and other equipment. The company will manufacture charcoal iron blooms, stay bolts and boiler tubes. The officers are: President, Edward W. Wright; vice president, Ambrose Beard, and secretary and treasurer, A. M. Bell.

Milliken Bros., Incorporated, 11 Broadway, New York, have decided to proceed with the plan announced a few months ago and will erect a steel plant on Staten Island consisting of five 50-ton open hearth furnaces, blooming and finishing mills, engine, boiler houses, etc., for which equipment is being purchased. The location affords excellent shipping facilities for the large export trade of the company. The company will purchase machinery amounting to about $1,000,000.

The Riverside Engine Co., Bradford, Pa., has been organized by Edward Gray who recently purchased the interest of J. B. Smithman in his engine works at Oil City. An additional building 60 x 180 ft. will be added to the present machine shop in the early spring. A number of new machines will be required, among them planers, lathes, a large boring mill, a horizontal spindle drilling, milling and boring machine, motors, arc lights, several traveling cranes, radial drills, etc. The company will manufacture large gas engines and air and natural gas compressors.

Fires:—

The foundry of the Evans Mfg. Co., Butler, Pa., sustained a $5,000 loss by fire Nov. 19.

The Indiana Edge Tool Co., Gas City, Ind., was destroyed by fire Nov. 14, with a loss of $25,000.

The wire-weaving plant of the Gilbert, Bennett Mfg. Co., Georgetown, Conn., was destroyed by fire Nov. 16, with a loss estimated at $75,000.

The coal washery of the Bessemer, Ala., plant of the United States Cast Iron Pipe & Foundry Co., recently destroyed by fire, is being rebuilt.

The foundry building of the Walsh Brake-Shoe Co., Moline, Ill., was burned Nov. 16, with a loss of $40,000, partially covered by insurance. A number of valuable patterns belonging to the Rock Island Railroad were consumed.

The entire west plant of the T. H. Brooks Foundry Co., Cleveland, was destroyed by fire Nov. 24, the loss being placed at $50,000. The plant was devoted to structural and ornamental work and contained pattern, machine, fitting and structural shops. The other section of the works was not injured and operations have already been resumed, so that little delay will be ocasioned in the filling of orders on hand. The burned plant will be rebuilt at once and such machinery as was ruined will be replaced. The Otis Steel Co., located just across the street, escaped any loss of consequence.

General Industrial Notes:—

The Union Steel Screw Co., Jackson, Mich., is to remove to Albion, Mich., where it will occupy the building of the American Harness Co.

The Atlas Wire Works at South Bartonsville, Ill., has begun operations with 200 men employed. The Keystone Fence Co. takes its product.

Frank D. Moses, Trenton, N. J., who recently purchased the buildings of the Trenton Steel Co., will use them in the manufacture of gas works machinery.

The American Scrap Iron Co., Akron, O., has purchased a new yard in that city, installing track scales, derrick, crane and improved machinery. Its capacity is greatly increased.

The Republic Iron & Steel Co., has resumed operations in the finishing department of its plant at Covington, Ky., and other departments are to be started again in the near future.

The Mitchell Coal & Coke Co. has sued the Pennsylvania Railway Co. to recover $95,894 damages claimed for rebates allowed a number of rival companies and denied the complainant.

Weston Donaldson, dealer in scrap iron, with a large yard at Pottstown, Pa., has removed his Philadelphia office from the Philadelphia Bank building to rooms 908-09 Arcade building.

Electric traction is to be employed for traffic in the Simplon tunnel, completed last year. The plant at Brigue, which supplied power during the period of construction, is to furnish the required current.

The Detroit Iron & Steel Co., Detroit, Mich., will blow out its blast furnace the latter part of the month for relining. The furnace has been run steadily except for a few days since early in 1904.

The Carnegie Steel Co. has taken over the Steubenville furnace, Steubenville, O., formerly operated by the National Tube Co. The furnace was blown in Nov. 17 and will make about 300 tons per day.

The Crucible Steel Co. has been upheld by customs authorities in its contention that cold rolled and brightened steel sheets in strips are not subject to an additional duty under the brightening and polishing clause.

Several American manufacturers have submitted bids for supplying new machinery for the Mexico Electric Tramways, Ltd. Transformers for the power house and also machinery for substations in different parts of the city will be required.

The Simpson Iron Co. has sold its foundry to the Safety Meter Lock Co., Columbus, O. The foundry has been overhauled and put in operation and is used to manufacture the company's various locking and stop cock devices.

It is reported in Buffalo that the Pressed Steel Car Co., has purchased forty acres of land in West Seneca, near the city line of Buffalo, adjoining the plant of the Buffalo & Susquehanna Iron Co., for the erection of works for manufacturing cars.

The New York Air Brake Co., will spend in the neighborhood of $1,000,000 improving its Russian plant. At the plant at Watertown, N. Y., 17,000 men are now employed against 8,000 last year, and orders booked will keep the company busy for the next twelve months.

The Poughkeepsie Engine Co., will move the New Birdsall Co., Auburn, N. Y., which it has recently purchased, to Poughkeepsie, N. Y. Engines, saw mills and threshing machinery, the products of the Birdsall Co., will be manufactured by the Poughkeepsie Co.

The American Steel & Wire Co., at a great outlay of time and money in experiments, has hit upon a solution of the smoke problem by the installation of the best type of mechanical stoker. The plan has proved exceedingly satisfactory at the Cleveland plants of the corporation.

Building permits issued in Greater New York since the

first of the current year have passed the $200,000,000 mark —almost double the record of last year. The year's construction throughout the country will reach $1,000,000,000, which largely accounts for the enormous demand for structural steel.

The assets of the Brown-Corliss Engine Co., Milwaukee, which recently went into the hands of a receiver, are stated as $799,500 with liabilities of $424,628. The plant will be operated by the receiver for several months while the owners are working for its reorganization. Large pending contracts will be filled.

The Superior Court of Pennsylvania has declared in favor of the United States Steel Corporation in its claim to a narrow strip of land along the Monongahela river opposite Monessen, Pa., which it sought as an approach for a bridge to the Monessen mills for the Union Railroad Co. The Pennsylvania Railroad Co. also sought the land.

The King iron mines, Ledgewood, N. J., will be put in operation in the near future by F. A. Thomas & Co., Newark, N. J. About $10,000 has been spent for new equipment and it is understood that an ore separator will be installed later on. The entire output will be used by the Bethlehem Steel Corporation, South Bethlehem, Pa.

Crocker-Wheeler Co., Ampere, N. J., manufacturer and electrical engineer, has established an industrial engineering department in which is concentrated all its work in the line of industrial engineering as applied to railway shops, machine shops, etc. J. K. Warner Davenport, E. E., a consulting engineer with a specialty of industrial work, has become associated with the company.

The general naval board has recommended the construction of three first class batleships, 18,000 tons and eighteen knots speed, three 5,000-ton scout cruisers, five gunboats and a lot of smaller craft. The board of construction, however, has entered objections, urging that the battleships be of 16,000 tons displacement and that only two small gunboats and no smaller craft be contracted for.

Whitehead & Kales, contractors and engineers for structures in steel, jails and prisons, Detroit, have incorporated with a paid-up capitalization of $100,000 under the name of the Whitehead & Kales Iron Works. James T. Whitehead is president and treasurer and Wm. R. Kales vice president and engineer, each holding 4,500 shares of stock, James T. Warner is secretary, and Wm. H. Steger superintendent.

A somewhat remarkable situation is disclosed by the statistics of pig iron stocks in England, collected by C. Mayer, secretary of the New York Metal Exchange. In spite of the great activity, stocks of pig iron have between Jan. 1 and Nov. 2 of this year actually trebled in quantity. On the earlier date stocks in the public stores were 216,658 tons, while at the beginning of the present month they had increased to 705,577 tons, an increase of 488,919 tons.

The Independent Pneumatic Tool Co., Chicago, has opened an office at 207 Germania Bank Bldg., Pittsburg, in charge of Richard D. Hurley. A complete line of "Thor" piston air drills, reversible flue rolling, reaming, tapping and wood boring machines, and pneumatic riveting, chipping, calking and beading hammers will be carried. James C. Dennis has entered the business employ to travel from the New York office.

The Buckeye Gas Engine Co., Delta, O., has been organized to manufacture gas engines, gasoline fire engines and special machinery. The company has purchased the plant and business of the Underwood Mfg. Co., Elmore, O., which it will remove to Delta, O., where a large plant will be erected. Among those interested in the company are: C. C. Reed, J. M. Longnecker, W. T. Saxton, O. J. Wisman, W. E. Fowler and others of Delta.

The Zanesville Malleable Castings Co., Zanesville, O., has acquired the plant of the Zanesville Malleable Iron Co., and will install many improvements. The officers and directors are: Frank Moore, Pittsburg, president; Harry A. Hall, Pittsburg, treasurer; J. M. Barringer, formerly with the Buckeye Malleable Castings Co. of Columbus, general manager; J. T. Gardner, Ridgeway, Pa., and H. A. Sharpe, C. T. Marshall and J. F. Brown of Zanesville, directors.

The Marietta, O., plant of the United States Sheet & Tin Plate Co. is to be put in operation at once. Large interests have been purchased by W. S. Ravenscroft, president, of Pittsburg, and M. F. Kline, of Ridgeway, Pa., who becomes secretary and treasurer. George J. Humbert, of Connellsville, Pa., succeeds D. A. Garden as general manager. The Newcomerstown plant is being put in shape for operation and a bar mill is to be added to the Byesville, O. plant.

The United States Circuit court of Kentucky has ruled that notes aggregating $110,000 held by the Fort Pitt and Fourth National banks of Pittsburg shall be held as valid claims against the Continental Iron Co., which became involved in financial difficulties while operating the Wheatland, Pa., mill. This decision reverses the finding of the referee, who some time ago rejected the claim. Henry B. Shields was in charge of the plant.

Custom authorities have ruled that scrap steel may be imported free of duty when it can be proved that it is being returned to this country in an unimproved coudition. In the case at issue hoop steel was shipped to Canada for the manufacture of fence locks, a considerable amount of scrap resulting from the cutting or stamping of the articles. These clippings were kept separate and were returned to the United States, authorities at Buffalo levying duty at the rate of $4 a ton. Their action was overruled.

The Hydraulic Machine Company, Pittsburg, operating a steel iron and brass foundry, has decided to divide its plant and organize the Iron City Steel Casting Company, to operate the steel casting department. The plant will be enlarged and two 10-ton open hearth furnaces will be added to the present 15-ton furnace, giving the plant a capacity of 1,000 tons per month. Three additional cut-off saws, two additional cleaning barrels, seven emery grinders, two shapers, two planers and three lathes, and a new 150 h. p. engine will be installed in the finishing and cleaning department.

Trade Notes:—

The Modern Steel Co., of New Castle, Ind., received the contract for the construction of a bridge, 603 ft. long, over the Wisconsin river at Portage, Wis. It will cost $45,000.

The Otis Elevator Co., will install 44 freight elevators in the new building of the Pittsburg Terminal Warehouse Co., Pittsburg, Pa. Each elevator will have a lifting capacity of 6,000 lb.

The C. E. Squiers Specialty Co., Cleveland, O., has sold to the Grasselli Chemical Co., for its Chicago plant 46 steam traps of regular size, and five of the No. 5 extra large size.

The Marion Steam Shovel Co., Marion, O., reports that it is unable to keep up with orders and has more business booked than at any other time in the history of the country.

The General Electric Co. has secured a contract for the equipment of a London underground railway. There will be twenty electric trains, of six cars each, and the multiple unit control system is to be employed.

The new structural shop of the Jeffrey Mfg. Co., Columbus, O., is now in full operation and many of the departments of the plant are working double time, the department for electrical locomotives breaking all records.